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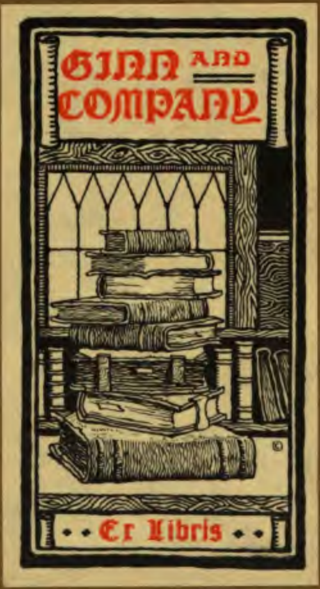

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# EFFICIENCY
# ARITHMETIC
## PRIMARY

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BY

**CHARLES E. CHADSEY, Ph.D.**
SUPERINTENDENT OF SCHOOLS
DETROIT, MICHIGAN

AND

**JAMES H. SMITH, A.M.**
INSTRUCTOR IN MATHEMATICS AND MANUAL TRAINING,
SCHOOL OF EDUCATION, UNIVERSITY OF CHICAGO

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# PREFACE

The recent movement in testing results in education by means of standard scales and tests has revolutionized methods of instruction in many of the subjects.

One of its results in the field of arithmetic has been to emphasize the necessity of well planned drill work to secure a proper amount of speed and accuracy in the fundamental processes.

This book, recognizing the importance of both speed and accuracy, furnishes a large amount of well selected drill material. On the other hand, the work is planned to be interesting to the child through proper motivated problems and games.

The principle that *the child learns to do by doing* has been kept constantly in mind in the preparation of this volume. The children make many of their own tables, prepare many problems, and enter into real activities which can be readily adapted to schoolroom conditions.

The child's interests and ability have been kept in view throughout the book. The problems are simple and the material is drawn almost entirely from children's every day environment and interests. In a number of instances, the work centers around a topic which may be carried on as a real activity apart from the book. The shopping, in first grade, the games in second and third, the school store and orange problems are examples of this type of work.

The attempt to teach too many topics in arithmetic implies a scattered effort and a low standard of achievement. This book features addition, subtraction, multiplication, and division, with simple work in fractions and denominate measure. Special mention may be made of the Exercises for Practice at the end of the book. There are no formal definitions to be learned. The pupils are to formulate such as are essential, when the necessary ideas have been presented to them.

In accordance with the modern ideas of filing and cataloging, the arrangement of this book is largely topical. This, however, does not necessarily mean that a topic must be followed to its logical close before another may be taken up. But if a teacher wishes to carry a topic through, she may find the material much more easily by this arrangement than any other.

The aim of this book has been not only to provide usable material, but also to furnish suggestions for further work along the same lines.

In the preparation of this Arithmetic, the authors have had the efficient aid of Miss Myra Banks, of the Winnetka (Ill.) Public Schools; and they are also indebted to Miss Katherine L. McLaughlin, of the School of Education, University of Chicago, and to Miss Annie J. Robinson, Principal, Case-Woodlawn School, Cleveland, for valuable criticisms and suggestions.

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# INTRODUCTION TO FIRST AND SECOND GRADE WORK

Since pupils in the first and second years are not usually supplied with books, the first pages of this book have been prepared for the teacher's use.

The child's first lessons in number should naturally grow out of his play and schoolroom activities. The material used in these lessons should vary according to the spirit and locality of the school. However, there are certain common ideas, within the comprehension of the pupil beginning the study of numbers, upon which educators fairly well agree.

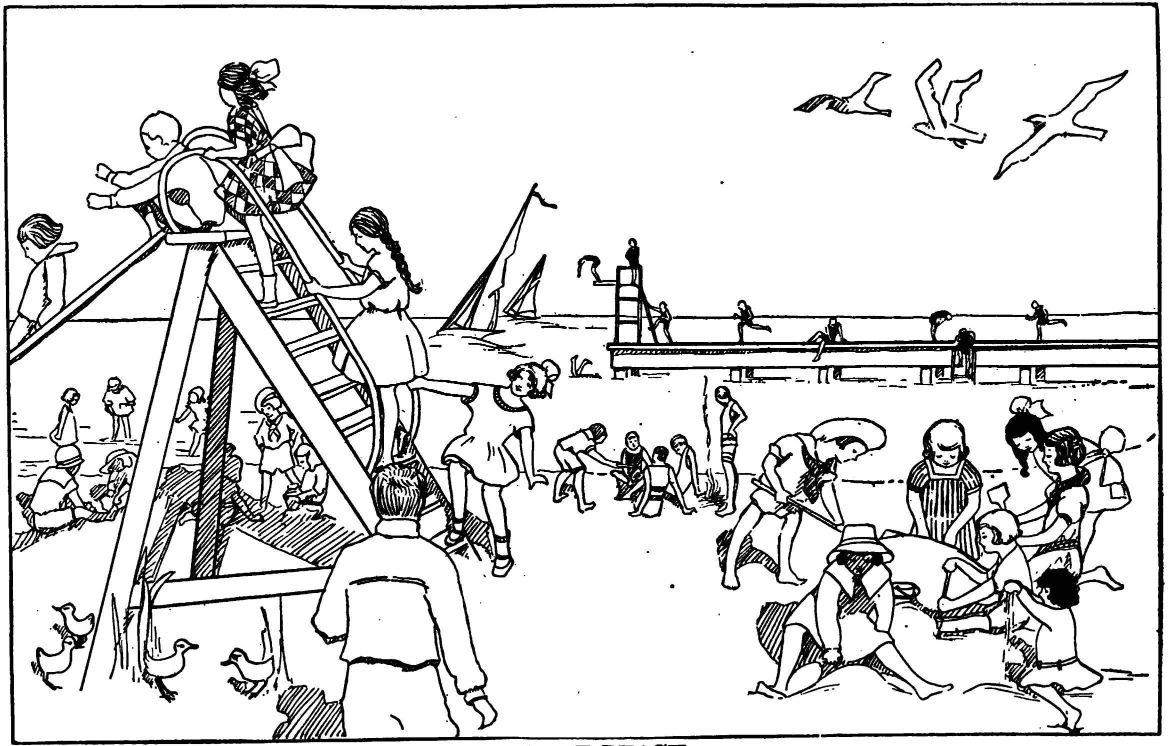
It is not assumed that the work as outlined entirely covers the work that should be done in the first and second grades but types of work are suggested which the teacher can amplify to meet her needs.

The first grade work should furnish a large amount of *concrete experience* with number. The group recognition of objects should be especially emphasized. Constructive work, such as the making of group cards, gives valuable number ideas through first hand experience with objects. Games should be a prominent feature of the number work of these grades. See the teaching suggestions in the back of the book for valuable material on games adapted to these grades.

The more formal work in simple number facts is left for the second grade. The work in this grade should be mainly concrete at first but the teacher should not make the child use objects if he remembers a number fact from previous experience.

The number facts have been purposely presented in an irregular order because that is the way a child meets them in his daily experiences.

Attention is called to the systematic use of concrete problems in connection with each number fact. See pages 19 to 40.



AT THE BEACH

# PRIMARY ARITHMETIC

## PART I

### COUNTING

**1.** Have you ever been at the beach?

**2.** Have you played in the sand?

**3.** Have you watched the gulls and sail-boats?

**4.** Have you seen boys diving from a pier?

**5.** How many yachts do you see in the picture?

**6.** The birds flying are lake gulls. Count them.

**7.** The other birds are sand-pipers. How many sand-pipers are there?

**8.** Even on warm days people become chilled from bathing, and enjoy a fire. How many boys are around the fire?

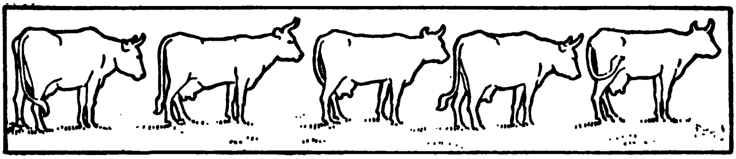
**9.** Find the little girl sifting sand. How many children are in that group?

**10.** The children on the chute-the-chutes seem to be having a good time. How many are there?

**11.** Look through the chute-the-chutes. How many children are playing?

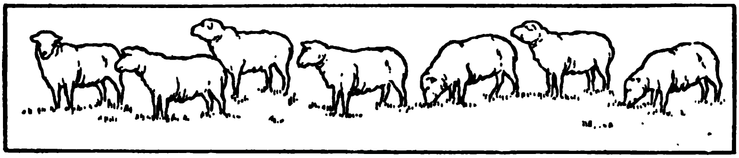
**12.** See those boys diving. All you can see of one is his legs. How many altogether are diving?

### COUNTING



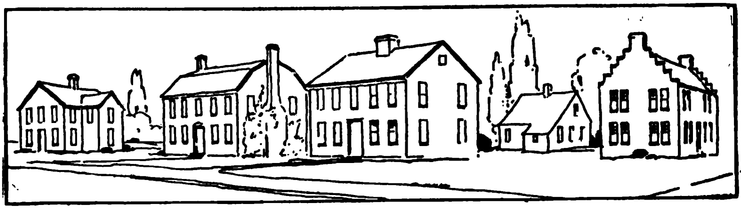
1. How many cows are there in this picture?

2. Make as many marks on the blackboard as there are cows in the picture.



3. How many sheep do you see here?

4. Tap with the pointer as many times as there are sheep in the picture.



5. How many houses do you see in this picture? Outline five houses with pegs.

Similarly develop the other numbers from 2 to 10, using pictures or objects, with various means of indicating the number, such as bouncing a ball, waving a flag, clapping, etc.

1. How far can you count?

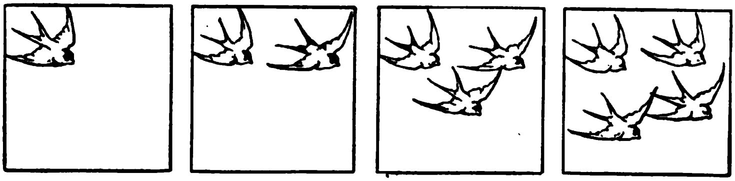
Very often children have learned to count at home. If, as a rule, you find they cannot count, modify the suggestions of the book to suit their ability.

2. What can you find to count in your schoolroom?
3. How many doors are there?
4. Is there anything on the doors you could count?
5. Can you count the windows?
6. Is there more than 1 pane of glass in each window?
7. Can you count the panes in all the windows?
8. On how many sides are there blackboards?
9. Do you find anything in the chalk trays to count?
10. Count the pictures on the wall.
11. Count the chairs.
12. What has each chair that you can count?
13. How many rows of desks are there?
14. Can you tell how many seats in each row?
15. What else in your schoolroom can you count?

Adapt so as to keep the counting below 11.

16. Count the blocks coming to school.
17. Can you tell how many streets you cross?
18. Are there any vacant lots?
19. What other things on the way to school could you count?
20. When you are at home, see what you can find to count.

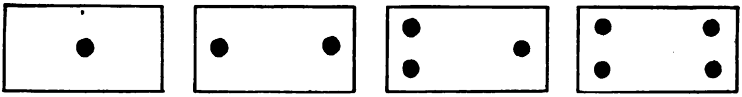
## COUNTING BY GROUPS



**1.** How many birds do you see in the first picture?

**2.** How many do you see in the second?

**3.** How many do you see in the third picture? In the fourth picture?



**4.** How many dots do you see in the first picture? In the second? In the third? In the fourth?

**5.** Look around the room. Where do you see two things together? Where do you see four things together?

**6.** How many groups of three can you find?

Let the children make flash cards by pasting squares of colored paper in groups on stiff paper or cards. Use the best ones for class drill in *recognizing groups of 3, 4 or 5 without counting.*

At first a pupil may have to count the number of squares on the card to tell the number in the group, but encourage his remembering the groups so that he will not have to count the next time.

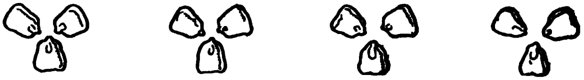
Another drill is to show a small group of objects for just an instant. Let the children then try to tell how many things there were. The group may be objects quickly covered with a cloth, pictures on a card, large marks on the board hid by a map, etc.

This recognition of groups is a necessary preparation for teaching the addition facts. See p. 18.

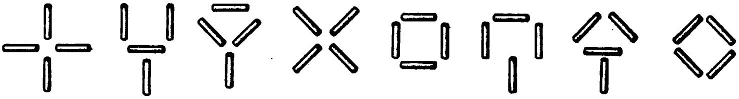
### BORDER DESIGNS

1. Lay out on your desk 2 grains of corn.

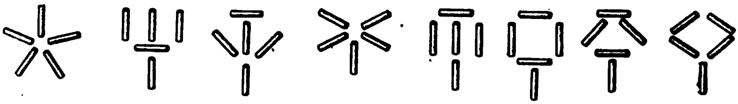
2. You can make a pretty border by laying groups of 3 grains across your desk so:



3. In how many ways can you arrange groups of 4 pegs to make a border?



4. See what you can make with 5 in each group. Use pegs, corn, melon seeds, or little strips of colored paper.



5. Would you like to copy your border on paper with colored crayon?

6. Try making a border, using first one group, then another.

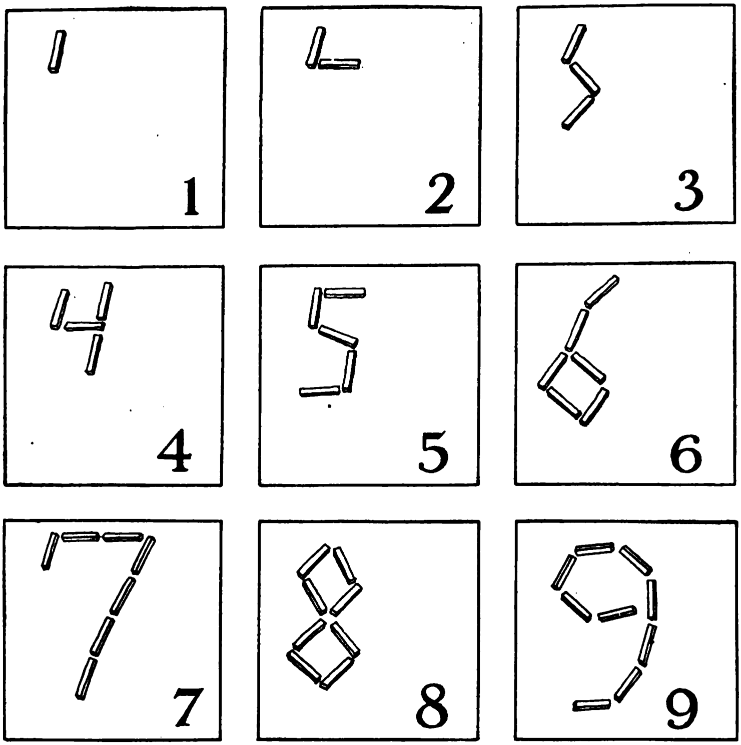
7. Would you like to copy your prettiest border on paper with colored crayon?

These little designs will be more interesting if used for some real decorative purpose. They might be applied to the envelopes on pp. 11 and 12, or to the cover of the telephone directory, suggested on p. 8.

The teacher should create or find some school room situation out of which the *need for reading numbers will arise.* The children may be led to notice the numbers on the school room doors, on the calendar, on their houses, on street cars, pages of books, etc. To mark the rows of desks with little number banners is one way to arouse their lively interest.

## COUNTING AND WRITING IN FIGURES

This picture may easily be reproduced in a blackboard drawing, or worked out on a table with shoe pegs or other small sticks of uniform size, or with pieces of chalk rubbed flat on one side.



Associate the symbol with the object by having the pupils show how many things are meant by the figure 2, by the figure 3, by the figure 4, etc. They may hold up the required number of objects, make the required number of marks, take the required number of steps, etc.

Lead the children to see that they can tell each printed figure by counting the number of straight lines in the one made with pegs, since *the number of straight lines in each figure corresponds to its number value*, one line for 1, two lines for 2, three lines for 3, etc.

### HIDE THE 3

"Hide the 3" is like "Hide the Thimble." While the rest of you "close your eyes"——[1] will put different figures around the room in plain sight. Of these figures only one will be a 3. When I say, "Ready," you may all look. The one who first sees the 3 may say "I spy." When 3 children have spied the 3, the first to see it may arrange the figures for the next search.

The variations with this are obvious.

### A FIGURE HUNT

There are figures all around the room.
——, bring me all the 5's you see.
——, you may bring the 8's.
——, may bring all the 4's, etc.

### TAG

Begin with 1 and number around the class. Write your number on a piece of paper. Pin it on. Now we are ready to play tag.

All "close your eyes" except ——. You run as softly as you can and touch someone. If he can tell your number he may chase you. You try to get back into his seat without being tagged. If caught you must touch some one else.

### NUMBERING THE HOUSES

Let us play aisle 1 is —— street. What can the rows of desks be?

Your house must have a number or the postman cannot find you. Count down the row as houses on a street are numbered.

Write your number and put it on your house.

Who will be the postman and deliver each letter to the right house?

---

[1] The teacher will supply here, and in subsequent lessons when spaces are left, the name of the pupil she desires to take part in the exercise.

## NUMBERING THE HOUSES

The first time the teacher can address the letters herself, putting on only the street and number. The "postman" can supply the names. Later some of the children may be able to address the letters.

Here comes the grocer's boy.

"I have — packages for —— street."

"These — packages are for —— street."

Let the children play they are "grown-up" people, and make calls on one another, finding the right houses by number.

They can telephone, using a directory of numbers written on the board or in little books they make themselves.

Not only the postman and the grocer's boy, but the messenger, the paper boy, the milkman, the expressman, etc., may find these addresses.

None of these games is to be used verbatim. Develop the idea in the words best suited to the children.

Plan these games so that the children will receive practice in both *reading* and *writing* figures up to 15.

## HOW TO WRITE FIGURES

1. Show how neatly and plainly you can copy this line of figures.

1 2 3 4 5 6 7 8 9 0

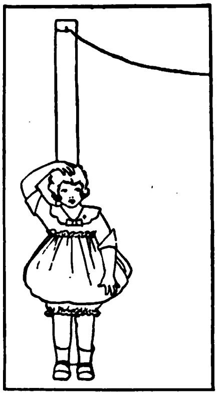
2. Write each one four times in column form.

3. Now write them in this form:

0 9 8 7 6 5 4 3 2 1

Many errors in calculation are directly traceable to carelessness in writing figures, hence it is quite important that pupils be taught at the very beginning how to make *neat* and *legible* figures. Their way of making 4's, 5's and 8's, especially, should be watched and corrected if need be.

One should not expect the figures made by first grade pupils to be as small as these.



When speaking of deep water the boys sometimes say: "It is over my head twice." Or, "The water there is twice as deep as I am tall."

**1.** What is the little girl in the picture doing?

**2.** The post is how many times as tall as she is?

**3.** How could you tell about how high this room is?

**4.** If it is about 4 times as tall as you are, it is about how many times as tall as your teacher?

**5.** What else can you measure by yourself?

**6.** Have you ever seen anyone measure cloth or ribbon by stretching it at arm's length?

**7.** Measure string, raffia, and anything else you think of by arm lengths.

**8.** Your skipping rope is about how many times as long as your arm?

**9.** Walk across the room and see how many steps wide it is.

**10.** Walk from one end of the room to the other. How many steps long is the room?

**11.** How many steps long is the outside hall in your school?

The work on these pages, in measurement, is not planned for consecutive use, being given in this order for the teacher's convenience. This measuring with the units familiar to the child paves the way for *later work with standard units of measure* and *cultivates his sense of values.*

## MEASURING LENGTH

**1.** ——, you may choose 6 children to come up in front. Have them stand in line 2 steps apart.

**2.** ——, choose 5 children to stand in line 3 steps apart, etc.

(The children are to be standing in line.)

**3.** "Beginning with ——, every other one walk 2 steps forward."

**4.** "Everyone in the back line, 2 steps sidewise."

The terms "to the left," "to the right," "odd" or "even" may be used, if your pupils understand them.

**5.** Mark with wet chalk along a crack in the floor. Show the part of it which you think would about equal 4 steps. Take 4 steps along the line to see how nearly right you are.

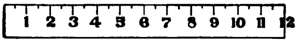
Such estimation, if rightly directed, affords valuable sense training. If conditions permit, take the children out of doors. Let them judge, then measure distances by steps. Keep distances within their ability to judge.

**6.** Instead of measuring the line with steps, let us measure it with this stick.

**7.** The line is — sticks long. How many sticks long is the room? Do not count any part less than a whole stick.

**8.** The "stick" is called a foot-rule. We say it is a foot long. How many feet wide is this room?

From measuring given distances with such unit as a "walking step," it is very easy to introduce measuring with a recognized unit such as the foot rule. For use in such measurement let each child make for himself a cardboard rule, 12 inches long and 1 inch wide, divided into half inches.



### MEASURING BULK

**1.** Here are 2 cups of the same size. —— may fill one with water, using a teaspoon. —— may fill the other, using a tablespoon. Which one will be able to fill a cup with the fewer dips?

**2.** Find how many cupfuls of water it will take to fill this pail.

**3.** If you use a small cup must you fill it more or fewer times than if you use a large cup?

**4.** Play the sand is sugar. How many scoops of sugar does this bag hold?

**5.** Use a smaller scoop. How many small scoopfuls are needed to fill the bag?

This work has innate interest for the child. He has seen his mother measure milk, sugar, flour, etc., by the cup in baking. In your presentation recall the familiar use of these different measures.

### MEASURING SURFACES

**1.** Cover one-half of your desk with small squares. Use larger squares to cover the other half.

**2.** Which half of your desk has the most squares on it?

### SENSING WEIGHT

**1.** Shut your eyes. Which stone is the heavier of these two?

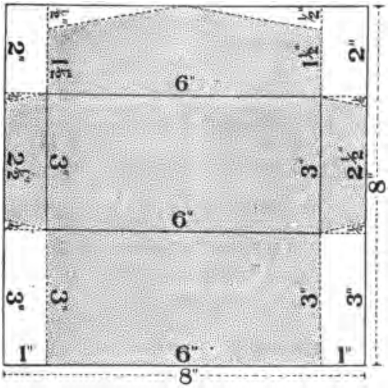
**2.** Which is heavier, a large box packed with blocks or a small box packed with the same kind?

**3.** Which is heavier, a box filled with sand, or another just like it filled with sawdust?

## MAKING A PURSE

Perhaps you have been shopping with your mother or aunt. Maybe she let you hand the money to the clerk or hold some package for her.

We can play going shopping and buy things in a store. But first we must make a purse to hold our money. Then we shall make our store.

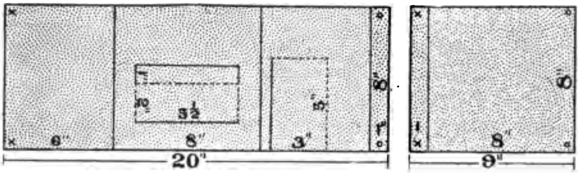


Let the children first try to make a purse by folding paper without definite measurements. This attempt helps them to understand the relation of the pattern to the purse.

When the purse is to be made, give each child an 8 inch square of paper. If possible have it in alligator skin finish. First have the four long lines drawn and then have the corners cut out. The flaps need not necessarily be trimmed at the corners as shown. Turn the flaps in and fasten to the front with brads. If no toy money is available, the children can make some by tracing around real coins and writing the proper denominations on the circles.

This same pattern may be adapted for making the envelope in which to keep the toys. An oblong 8″ by 10″ forms the base. Use the same flap measurements as in the purse, and paste the flaps outside. A decoration may be applied if desired. See p. 5.

The children may also make little books for shopping lists. These are easily made by folding several sheets into book form and sewing down the crease. Covers of colored paper may be added if desired.



We can sell anything you wish in our store. We can cut out little dolls, toys, apples, carts and all sorts of things to sell. Perhaps you can make a bunch of bananas to hang in the window. We can mark the prices on little cards.

We shall need envelopes to keep all our things in when we are not playing store.

When we go shopping we shall ride on the street car. We shall pay the conductor with money out of our purses. He will make change for us.

### To the Teacher

This store, having no roof, is operated from the top. The storekeeper reaching in from above, hands the purchases through the window. The latter may be on little tables or just stood up against the wall inside.

Individual stores are interesting toys for the children. Several may help on a larger one for class use.

In the above pattern, fold on the heavy lines and cut on the dotted.

Fasten the back to the sides with brads at the places indicated with the checks and circles.

If a more elaborate problem is desired, a parapet roof may be pasted along the front and sides of the store.

### SENSING WEIGHT

Sometimes you say to your father or big brother, "Lift me to see how heavy I am." Then your sister says, "Lift me, too, and see who is the heavier."

This is one way of finding the weight of things, by lifting them. A clerk in the post office can tell without weighing whether a letter is too heavy or not to go for two cents.

**Plan tests such as would permit the children to judge weight by the size. This leads them to realize that when two things are of the same material, the larger is the heavier.**

### DAYS IN THE WEEK

**1.** Perhaps you have heard people speak of "next week," "last week," "the middle of the week," "a week from today."

**2.** Today is ——? A week from today is ——?

**3.** Shall we keep track on the board each day until —— has come and see how long a week is?

OCTOBER

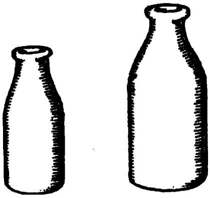
| Su | Mo | Tu | We | Th | Fr | Sa |
|---|---|---|---|---|---|---|
| .. | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | .. | .. | .. |
| .. | .. | .. | .. | .. | .. | .. |

**This keeping the question before their minds will impress the fact that seven days are a week, better than merely telling them. This may easily be done by adding each day as it comes, to a calendar on the board. Or each child may make a calendar on paper if desired. Children need to count the days in a week by experience before they really sense their number.**

**4.** You come to school — days and have vacation — days each week? This shows there are — days in a week?

**5.** If you have a week's vacation, that is — days?

## PINTS AND QUARTS

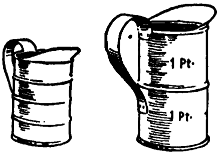


**1.** Do you know how much milk the milkman leaves at your house each day?

**2.** Which is smaller, a pint or a quart bottle? Here is one of each.

**3.** Using the pint bottle as a dipper to fill the quart bottle, how many times do you fill the pint bottle? A quart is — pints?

In the large cities people usually buy milk in bottles, but in the smaller towns the milkman sometimes measures out pints and quarts with measures like these.



**4.** Which is the pint and which is the quart?

**5.** How many times do you fill the pint measure in filling the quart?

The children can play milkman and measure pints and quarts. Give much actual practice in the measuring. Let them see how many quarts different pails, bottles, etc., contain; how many pints.

## NICKELS AND DIMES

**1.** What can you buy for a cent?

**2.** Which would you rather have, a 5 cent piece or a cent? Why?

**3.** A man gave his two children 5 cents each. He found 5 pennies for Louise, but that took all his pennies. What did he give James instead?

**4.** Tell all the things you can think of that cost a nickel.

### NICKELS AND DIMES

**5.** Perry had saved a nickel and 3 cents. That was — cents?

**6.** Richard earned a nickel and 5 cents. That was — cents? It was the same as — nickels?

**7.** Uncle Bob dropped a nickel and 4 cents into Helen's bank. That was the same as — cents?

**8.** What does it cost for 1 person to ride on the street car? For 2 persons?

**9.** When your father pays for your mother and himself, will he likely give the conductor 10 pennies? He will either give — nickels or one —.

Edwin's father said he could have all the pennies in his pocket each night if Edwin would save them, and Edwin's uncle said he would give Edwin as much again if Edwin could change the cents to the right number of nickels and dimes.

Edwin found pennies in his father's pockets as follows: Monday, 7 cents; Tuesday, 3 cents; Wednesday, 4 cents; Thursday, 2 cents; Friday, 6 cents; Saturday, 8 cents.

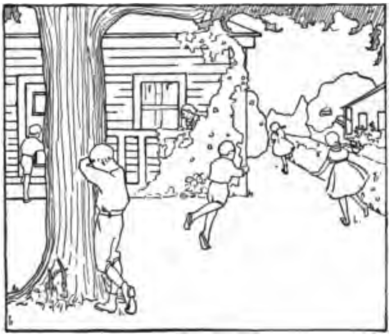
**10.** What coins might Edwin's Uncle have given him?

Let one child play being Edwin, another, the father, and a third, the uncle. Give "father" either real or toy pennies and "uncle" nickels and dimes to give "Edwin."

**11.** What things can you think of which cost 10 cents or a dime?

**12.** Helen spent 5 cents for a valentine and 2 cents for a stamp with which to send it. Altogether she spent — cents?

Another idea which will furnish a basis for more of such problems is changing pennies for nickels and dimes to fit in a metal coin purse. There are also nickel and dime banks.



**1.** In what games have you heard the older children count, "Ten, twenty, thirty, forty, fifty, etc.?"

**2.** Do you know how to count that way yourself? It is not hard to learn.

**3.** When a boy is "it" for "Hide and Go Seek," he counts by 10's to 100 because it takes less time than to put in all the numbers. He counts, "**10, 20, 30, 40,**" and so on. If he were not in so big a hurry, he would say, "1, 2, 3, 4, 5, 6, 7, 8, 9, **10,** 11, 12, 13, 14, 15, 16, 17, 18, 19, **20,** 21,—." Can you go on?

**4.** —may find a place to hide while — counts by 10's to 100.

**5.** You hide, —, while — counts from 1 to 20.

**6.** You may be "It," —, if you can count from 20 to 30 while — hides.

**7.** You may be "It" —, if you can count from 30 to 45. Etc.

The number form at the right of the page was arranged in the order given because investigations which have been made show that numbers seem to go up to most children when they count. See Howell's "A Foundational Study in the Pedagogy of Arithmetic" on number forms, p. 41.

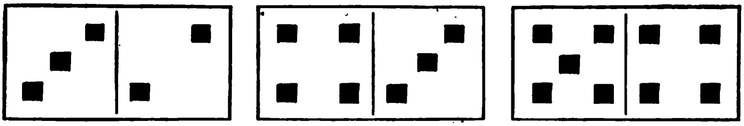
Diagram
**20,** etc.
19
18
17
16
15
14
13
12
11
**10**
9
8
7
6
5
4
3
2
1

## A PAGE FOR THE TEACHER

In first grade the children should at least learn to add 1 to every number through 11+1, and 2 to every number through 10+2. In the former case, the idea should be developed that 1 added to any number is the next higher number. If circumstances permit, the pupils may also work with the following facts and their converses:

3+3 = 6
4+3 = 7
5+3 = 8
6+3 = 9
7+3 = 10
8+3 = 11
9+3 = 12
4+4 = 8
5+4 = 9
6+4 = 10
7+4 = 11
8+4 = 12
6+5 = 11
7+5 = 12
6+6 = 12

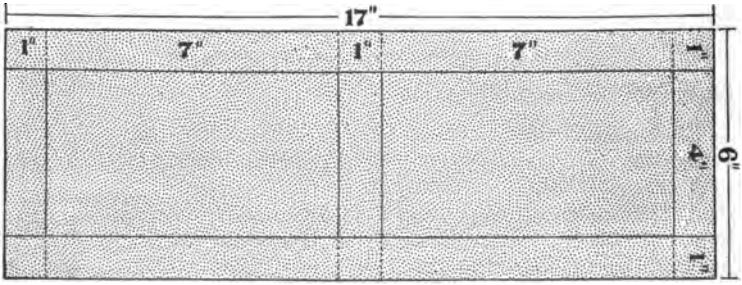
### Group Cards



The group card is an excellent means of teaching as well as drilling on these facts. Have each child cut from light manila cardboard the required number of 7″ by 4″ oblongs.

Next have them cut ½″ squares from colored paper, one color for each group and paste on the manila cardboard in domino forms as shown in the illustration. Red adhesive seals ½ inch in diameter may be used instead of the squares.

In working out this pattern for a domino box and cover, cut on the dotted lines and fasten the corners with brads.



## COMBINATIONS IN ADDITION

To the Teacher: The aim of pages 1 to 18 (First Year) is to give the children *concrete experience with numbers*, and of pages 19 to 46 (Second Year) to give them a *mastery of number facts*. Before taking up Second Year work see "Teaching Suggestions," pages 271-278, which give: (1) A collection of number games from many sources. (2) Directions for making, and suggestions for using "flash cards." (3) Notes on lesson-containing ideas for review.

Pages 19-46 are, first, an *outline* the teacher may follow in connection with the games and drills; and second, a *review* in the hands of the pupils. Note paragraph 1, bottom of p. 275.

### 2 + 1

Material needed: 2 red pencils, 1 blue pencil, 2 pieces of chalk in the tray, 1 piece somewhere else.

**1.** Here are 2 red pencils for ——. —— may give her this blue one. She has — pencils?

**2.** There are — pieces of chalk in the tray (Child goes to see; there should be 2) —— you may put 1 more there. How many pieces are now in the tray?

**3.** What else might we use for our problems besides pencils and chalk? What problems can you make?

### 3 + 2

Material needed: 5 blocks, 5 pencils.

**1.** —— may build a 3 story building with blocks. If —— makes it 2 stories higher, how many stories will it have in all?

3 stories and 2 stories = — stories.

The problems here given are intended to be largely suggestive and necessarily they are limited in number. Other problems relating to each combination, always within the comprehension of the children of this grade, should be supplied by the teacher with each lesson.

### COMBINATIONS IN ADDITION

**2.** Let us play the blocks are cars. —— may hitch 2 together. —— may couple 3. If —— and —— join their cars, how long will the train be?

3 cars and 2 cars = — cars?

**3.** —— may take 3 pencils. —— may take 2 more. Now give the pencils to ——. How many have you?

3 pencils and 2 pencils = — pencils?

**4.** Who can make some other problems about 3 + 2?

See "Teaching Suggestions," pp. 276 and 278, for reference to reviews preceding each lesson.

### 5 + 1

Material required: 6 cents.

**1.** How many fingers on one of your hands? Count your thumb, too. When you hold up all the fingers on one hand, and 1 more on the other hand, how many fingers are up altogether?

5 fingers + 1 finger = — fingers?

**2.** ——, here are 5 cents with which to buy a loaf of bread, and 1 cent for candy. How many cents have you?

5 cents + 1 cent = — cents?

To be most effective, arithmetic teaching during the second school year, must be with *real objects*, such as the child may see and understand. As an aid to the teacher, a list of suitable material is printed at the beginning of each topic. This list includes only such items as are easily within the reach of every school.

The children of this grade usually do not use books individually, and to economize space, all unnecessary illustrations are omitted from this section.

### COUNTING BY 2's TO 10

### 2 + 2

Required material: a pair of roller skates.

**1.** ——, hold up a skate so that all may see. How many rollers in front? How many in back? How many altogether?

2 rollers and 2 rollers = — rollers?

**2.** How many eyes have you? —— and —— together have — eyes?

2 eyes + 2 eyes = — eyes?

**3.** —— and —— together have — feet?

2 feet + 2 feet = — feet?

**4.** Let us count aloud all together as I write.

1 **2** 3 **4** 5 **6** 7 **8** 9 **10.**

### 3 + 1 4 + 2

Required material: 1 pair of roller skates, 6 red chairs.

**1.** There is a roller missing from this skate. How many rollers on it? When I put on the other, how many will there be?

3 rollers + 1 roller = — rollers?

**2.** ——, you may make a train of 4 red chairs. —— may couple 2 more. —— how many cars are on the train?

4 cars + 2 cars = — cars?

Pupils are often so eager to recite that when a question is asked there is likely to be a general class response before it is possible to limit the answer to any one person. In such cases the long accepted rule of pedagogy may be set aside, and the name of the one to recite may be stated as here, before instead of after the question. The growing custom of requiring summaries and criticisms from the other members of the class also lessens the need of this old order, as a stimulus to thought.

### COMBINATIONS IN ADDITION

**2 + 4** **5 + 2**

Required materials: 7 cents, 7 marbles, 7 nuts, 7 pieces of chalk.

**1.** ——, put 5 nuts in 1 pocket, and 2 in another. Take out all the nuts in 1 hand. You have — nuts?

5 nuts + 2 nuts = — nuts?

**2.** Each of you hold up all the fingers on your right hand and 2 on your left. How many fingers are up?

5 fingers + 2 fingers = — fingers?

**3.** If you had 2 nuts in your right pocket and 4 in your left, how many would you have?

2 nuts + 4 nuts = — nuts?

**4.** ——, if you take 2 pieces of chalk and then 5, how many have you?

2 pieces + 5 pieces = — pieces?

**5.** Who can make a problem about 5 cents + 2 cents?

**6.** Make a problem about 5 marbles + 2 marbles?

**6 + 1** **3 + 3**

Material required: 7 cents.

**1.** ——, here are 6 cents. —— may give him another. ——, how many cents has —— now?

6 cents + 1 cent = — cents?

**2.** ——, make a problem about 6 tops and 1 top.

**3.** Write problems about 3 girls + 3 girls.
About 3 ponies + 3 ponies, and 3 balls + 3 balls.

Use flash cards for further drill on these combinations.

## MEASURING WITH THE YARD STICK

**Review first work in linear measure, p. 10.**

You have found how many foot sticks long your room is. It is easier to measure the length of a room with a longer stick such as this. Why?

This stick is called a yardstick. We say it is a yard long. Perhaps you have heard of some things measured by the yard, such as a yard of ribbon, 3 yards of cloth.

A yard of ribbon is just as long as this stick. Three yards are as long as 3 of these sticks placed end to end.

**1.** Find how many yards wide your room is.

**2.** Find how many yards it is in length.

**3.** Measure the length and width of the hall by yards.

## COUNTING BY 3's TO 15

**1.** Put foot-rules end to end until you have a stick as long as a yardstick. How many does it take?

A yard = — feet?

2 yards = 3 feet + 3 feet or — feet?

**2.** Prove by laying foot-rules end to end until you have a line as long as 2 yardsticks.

**3.** How many more feet do you need to make 3 yards?

$$6 + 3 = ?$$

**4.** How many more feet are needed to make 4 yards?

$$9 + 3 = ?$$

**5.** How many more feet do you need to make 5 yards?

$$12 + 3 = ?$$

**All this work is to develop an appreciation of about *how long a yard* is. Give practice in estimating distances by yards. See p. 10.**

### COMBINATIONS IN ADDITION

**6.** Count the foot-rules on the floor. When you come to the end of each yard speak louder. Let us write such numbers larger than the others, so:

1 2 **3** 4 5 **6** 7 8 **9** 10 11 **12** 13 14 **15.**

**7.** Who can count the sticks by threes?

**8.** Who can count to 15 by 3's?

### A REVIEW LESSON

$3 + 2 = ?$ $2 + 2 = ?$ $4 + 2 = ?$ $5 + 2 = ?$
$5 + 1 = ?$ $3 + 1 = ?$ $6 + 1 = ?$ $3 + 3 = ?$

**1.** Play "Bounce." (See "Teaching Suggestions," p. 271).

**2.** "Climbing the Ladder."

**3.** Count by 2's to 10, beginning with 2.

**4.** Try counting back by 2's from 10.

**5.** There were 3 boys around a bonfire. 2 more came. Then there were — boys?

**6.** Mary had 4 dolls. She received 2 more for her birthday. She then had — dolls?

**7.** Count by 3's to 15, beginning with 3.

**8.** Can you count back by 3's from 15?

### 4 + 1 4 + 3

**Required material: 5 flowers, a chair and a three-legged stool.**

**1.** ——, let us have 4 flowers growing in the sand table. ——, you may plant 1 more. ——, how many flowers are now growing in the sand table?

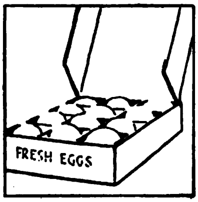
4 flowers + 1 flower = — flowers?

**2.** The chair has — legs? The stool has — legs? How many legs have the chair and stool together?

4 legs + 3 legs = — legs?

**6 + 2** **5 + 3**

**Suggested material: Empty egg case (use stones for eggs), 8 of any thing that might suggest dozens.**



**1.** How do we buy bananas, eggs, cookies? Do you know how many in a dozen?

**2.** How many are one-half dozen?

**3.** ——, you may pack ½ dozen eggs in this case. ——, how many eggs are in the case?

**4.** ——, pack away these other 2. ——, how many are now in the case?

6 eggs + 2 eggs = — eggs?

**5.** David found 5 eggs in the chicken-coop and 3 in the barn. Altogether he found — eggs?

5 eggs + 3 eggs = — eggs?

**7 + 1** **1 + 2** **2 + 3** **3 + 4**

**Suggested material: Empty egg case and 8 "eggs," 8 cents.**

**1.** —— may put 7 eggs in the case. —— may put in 1 more.

7 eggs + 1 egg = — eggs?

**2.** There are 7 days in a week. In a week and 1 day there are — days? 7 days + 1 day = — days?

### A REVIEW LESSON

$2 + 3 = ?$ $5 + 3 = ?$ $4 + 1 = ?$ $4 + 3 = ?$

$3 + 4 = ?$ $7 + 1 = ?$ $6 + 2 = ?$ $1 + 2 = ?$

By packing eggs in the box, find out:

$1 + 2$ $2 + 3$ $3 + 4$

**1.** Count by 2's to 10. **2.** Count by 3's to 15.

**3.** A yard = — feet?

**4.** 2 yards = — feet?

**5.** Make a problem using one of the combinations at the top of this lesson.

### WRITTEN EXERCISE

The plus signs in the following problems are to show the transition from the line to the column form. In blackboard work, they may be omitted, if desired, and the direction "Add" given.

**1.** $\begin{array}{r}4\\+1\\\hline\end{array}$ $\begin{array}{r}1\\+4\\\hline\end{array}$ **2.** $\begin{array}{r}5\\+3\\\hline\end{array}$ $\begin{array}{r}3\\+5\\\hline\end{array}$ **3.** $\begin{array}{r}3\\+1\\\hline\end{array}$ $\begin{array}{r}1\\+3\\\hline\end{array}$ **4.** $\begin{array}{r}4\\+3\\\hline\end{array}$ $\begin{array}{r}3\\+4\\\hline\end{array}$

**5.** $\begin{array}{r}6\\+2\\\hline\end{array}$ $\begin{array}{r}2\\+6\\\hline\end{array}$ **6.** $\begin{array}{r}5\\+1\\\hline\end{array}$ $\begin{array}{r}1\\+5\\\hline\end{array}$ **7.** $\begin{array}{r}7\\+1\\\hline\end{array}$ $\begin{array}{r}1\\+7\\\hline\end{array}$ **8.** $\begin{array}{r}3\\+2\\\hline\end{array}$ $\begin{array}{r}2\\+3\\\hline\end{array}$

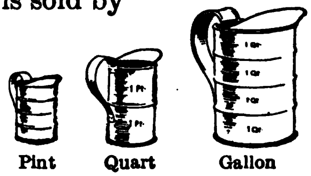
### PINTS, QUARTS AND GALLONS

Suggested Material: Gal., qt. and pt. measures.

**1.** What can you name which is sold by the pint?

**2.** What is sold by the quart?

**3.** Did you ever hear of a gallon of gasoline? A gallon of ice cream or maple syrup? Perhaps you can think of some other things measured by the gallon.



**4.** Fill the gallon measure using the quart as a dipper. How many times did you fill the quart measure?

A gallon = — quarts?

Give sufficient practice in changing gallons to quarts and quarts to gallons, at first by actual measurement, then later by using multiplication or division, as the case may be. Get the children to *think what they would actually do if measuring*, even when they have learned how to find the answer by calculation.

### COUNTING BY 4's TO 16

**1.** Show a gallon with quart milk bottles. How many quarts in a gallon? 2 gallons = — quarts?

**2.** Place 4 more quart bottles in a line with the 8.

8 quarts + 4 quarts = — quarts?

**3.** Count all the bottles. As you reach the end of each gallon, speak louder. 1 2 3 **4** 5 6 7 **8** 9 10 11 **12.**

**4.** What else can you count in this way?

**4 + 4** **7 + 2** **5 + 4**

Material needed: 2 gallon measures, 4 1-quart bottles or measures, 9 cents.

**1.** ——, you may be a milkman, and empty these small measures into this large one. The small measures hold a —? The large one is —?

**2.** ——, you may fill the other large measure. It holds — qts. The 2 measures hold — qts?

4 qts. + 4 qts. = — qts?

**3.** ——, if you have 7 cents in your bank, and put in 2 more, how many cents in your bank?

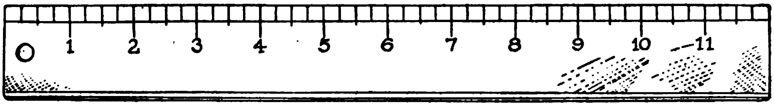
7 cents + 2 cents = — cents?

## COMBINATIONS IN ADDITION

**4.** ——, here are 5 cents for a tablet, and 4 cents for a pencil. How many cents have you?

5 cents + 4 cents = — cents?

**5.** What other things can you buy for a nickel and 4 cents?



Foot rule reduced to one-third its true length.

**1.** Find how many whole feet wide your desk is.

**2.** In the first grade you did not count the part of a foot left over, when you measured with the foot-rule. We shall now measure with that, too.

**3.** Look at your ruler. What do these figures show? Each one of these twelve parts is called an inch.

**4.** Your desk is — feet and — inches wide?

**5.** Measure your books. Find how long they are in inches. Find their width in inches.

**6.** What else can you measure by inches?

Measurements are best taught in construction work.

## A REVIEW LESSON

1 + 4 = ?
2 + 5 = ?
1 + 3 = ?
2 + 3 = ?
6 + 1 = ?
2 + 7 = ?

4 + 5 = ?
2 + 4 = ?
3 + 5 = ?
2 + 6 = ?
5 + 1 = ?
2 + 1 = ?

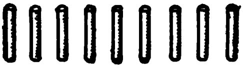
3 + 7 = ?
1 + 5 = ?
4 + 4 = ?
7 + 2 = ?
1 + 7 = ?
5 + 4 = ?

8 + 2 = ?
6 + 3 = ?
5 + 2 = ?
1 + 2 = ?
9 + 3 = ?
6 + 4 = ?

1. Count by 2's to 10, and back.
2. Count by 4's to 12, and back.
3. A yard = — feet?
4. Make a problem about 2 yards = 6 feet?
5. Count by 3's to 15, and back.
6. A foot = — inches?
7. $\frac{1}{2}$ foot = — inches?
8. — things = 1 dozen?
9. $\frac{1}{2}$ dozen = — things?
10. If your family uses a quart of milk every day, how many quarts do you use in a week and 2 days?

7 quarts + 2 quarts = — quarts?

11. What other problems can you make using the combinations at the top of the page?



**8 + 1     2 + 7     4 + 5     3 + 6**

Required material: Each child 9 pegs, inch squares, or other easily obtained and usable material.

1. If 8 children are skipping rope and 1 more child comes to play with them, how many children are playing together?

8 children + 1 child = —— children?

2. Take 9 pegs. You can arrange them so: 7 + 2 or 6 + 3. In what other ways could you arrange your 9 pegs? Write all the different ways.

### WRITTEN EXERCISE

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 7 | 2 | 2. | 5 | 4 | 3. | 6 | 3 | 4. | 5 | 2 |
| | +2 | +7 | | +4 | +5 | | +3 | +6 | | +2 | +5 |
| 5. | 8 | 1 | 6. | 6 | 1 | 7. | 4 | 2 | 8. | 7 | 3 |
| | +1 | +8 | | +1 | +6 | | +2 | +4 | | +3 | +7 |

**3 + 7  6 + 4  5 + 5  9 + 1**

Material: Each child may have 10 pegs with which to count.

1. In a garden there are 6 pink rose bushes and 4 white ones. How many rose bushes are there in all?

$$6 + 4 = ?$$

2. You have — fingers on each hand. On your 2 hands there are — fingers?

3. A nickel = — cents? 2 nickels = — cents?

$$5 + 5 = ?$$

4. Count by 5's to 25.

5. How can we arrange our 10 pegs to show 6 + 4 and 5 + 5 ?

6. If you put 3 in the first group, how many are left in the second?

$$3 + 7 = ?$$

7. Try putting 9 pegs in 1 group. That leaves — for the other.

$$9 + 1 = ?$$

8. What problems can you make about 3 + 7 =? About 9 + 1 = ? Write some of your problems out in words and we shall use them for our lesson tomorrow.

**9.** What other ways can you find to show 10?

**10.** Count by 10's to 100.

For drill on addends making 10, see "Teaching Suggestions," p. 276.

### A REVIEW LESSON

**1.** A quart = — pints? Count by 2's to 10, and back.

**2.** A nickel = — cents? Count by 5's to 25, and back.

**3.** A foot = — inches? $\frac{1}{2}$ foot = —— inches?

**4.** A yard = — feet?

**5.** $\frac{1}{2}$ dozen oranges = — oranges?

**6.** 1 dime = — cents? Count by 10's to 100.

**7.** A gallon = — quarts?

**8.** Count by 4's to 12 and back.

Give problems about the following:

**9.** 6 automobiles + 4 automobiles

**10.** 4 cars + 3 cars

**11.** 7 ponies + 2 ponies

**12.** 5 street-cars + 3 street-cars

**13.** 3 Jack O'Lanterns + 2 Jack O'Lanterns

**14.** 5 pieces of candy + 4 pieces of candy

**15.** 8 cents + 2 cents

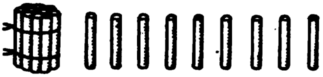
**16.** 4 post-cards + 2 post-cards

**17.** 9 mud-pies + 1 mud-pie

**18.** 5 snow-balls + 4 snow-balls

The teacher may substitute combinations on which the children need drill.

### ADVANCED ADDITION FACTS



See "Teaching Suggestions," p. 276.

Required material: Each child needs one bundle of 10 sticks or toothpicks and 9 loose ones.

1. In 13, there are — units?

13 = 1 ten + 3.

Prove this by counting with your sticks.

2. Thirteen really means "three and ten." Which part of "thirteen" looks like "three?" Which must mean "and ten?" 13 = 10 + 3.

3. In 14, there are — units?

14 = 1 ten + 4.

4. Show with your sticks that 14 = 1 ten and 4 units. What does fourteen really mean? Show the "four." Where is the "ten?"

14 = 10 + —?

5. In 15, there is — ten?

15 = — ten + —?

15 = 10 + —?

In the word "fifteen," "fif" is a short form for "five."

6. 16 = 1 ten + — units. 16 = 10 + — ?
7. 17 = 1 ten + — units. 17 = ? + 7
8. 18 = — ten + — units. 18 = ? + ?
9. 19 = ? + ? units. 19 = ? + ?
10. Show how "sixteen" says 6 + 10.

**11.** What does the word "seventeen" mean? Sixteen?

**12.** How can you tell what numbers equal nineteen?

**13.** If there are 3 oak trees in one field and 10 in another, how many are there in these fields?

**14.** Andrew has 10 marbles in one pocket and 4 in another. How many marbles has he?

**15.** Jane's carfare to the park was 10 cents, and while there she bought an ice-cream cone for a nickel. How much did she spend altogether?

Make some problems about:

10 + 6 = ? 10 + 8 = ? 10 + 7 = ? 10 + 9 = ?

## 9 + 8 7 + 6

Required material: Each child needs 1 bundle of 10 sticks and 7 loose ones. See "Teaching Suggestions," paragraph 3, p. 276, for reference to reviews before each lesson.

How many sticks have you?
"I have 10 sticks and 7 sticks or 17 sticks."

Take one stick from your 10 and put it with the loose ones. How many sticks are left in the bundle? How many are now loose? You have the same number of sticks as before, or — sticks.

Then 9 sticks + 8 sticks = — sticks?

**1.** Coming to school, Mildred saw 9 robins and 8 bluejays. How many birds did she see altogether? 9 birds + 8 birds = — birds?

**2.** Have 10 sticks in one bundle and put away all except 3 of the loose ones. You now have 10 sticks and 3 sticks = — sticks?

### COMBINATIONS IN ADDITION

**3.** Take 3 sticks from the ten, and lay them with the loose ones. How many sticks are now in the bundle? How many are loose? Instead of 10 sticks and 3 sticks = 13 sticks, you have 7 sticks + — sticks = 13 sticks?

**4.** A week and 6 days are — days?

7 days + 6 days = — days?

**5.** What problems can you make about 7 + 6?

## 9 + 7 8 + 7

Required material: One bunch of 10 sticks, 6 loose.

You have 10 sticks + 6 sticks = — sticks.

9 sticks + 7 sticks = — sticks?

**1.** Evelyn cut out 9 pictures for her scrap book, and Virginia cut 7 more. How many did they cut together?

**2.** Arrange your sticks to find out:

8 sticks + — sticks = 15 sticks?

**3.** 8 boys and 7 girls play Indian together. How many Indians in their band? 8 + 7 = ?

## 7 + 7 9 + 4

Required material: 1 "ten" and 4 loose sticks to be used by teacher or one pupil in front of class.

**1.** 10 sticks + 4 sticks = — sticks?

**2.** If I wanted 7 sticks in the bundle, how many should I take out? There would then be — loose sticks? I should have — sticks + — sticks = — sticks?

**3.** In 2 weeks there are — days?

**4.** There are 7 children present in the outside row and 7 in the fourth. How many children are present in the 2 rows?

7 children + 7 children = — children?

**5.** Return the 3 sticks to the bundle so it contains 10 as before.

Put aside 1 loose stick. You now have 10 sticks + 3 sticks = 13 sticks.

**6.** Find out: — sticks + 4 sticks = 13 sticks?

**7.** Josephine has 9 gold and 4 silver fish. How many fish has she altogether?

9 fish + 4 fish = — fish?

**8 + 9 7 + 9 4 + 9 7 + 8**

**1.** Some Boy Scouts on a "hike" walked 8 miles one Saturday and 9 miles the next. How many miles did they walk during the two "hikes?"

**2.** Roxanne found 7 purple and 9 white violets blooming in her spring garden. How many violets did she find in all?

7 violets + 9 violets = — violets?

**3.** If 4 children in a park meet 9 other children, how many children are together? (See picture page 52)

**4.** The cook made 7 loaves of bread in one baking and 8 in the next. How many loaves were made in the two bakings?

## COMBINATIONS IN ADDITION

**8 + 5**　　　　**9 + 9**

**1.** Pretend you have 1 ten and 3 loose sticks. You have 10 sticks + 3 sticks = — sticks?

**2.** How many more should you take out to make the second number 5?

**3.** How many are still in the bundle? You now have — sticks + — sticks = — sticks? Prove with sticks.

**4.** Instead of sticks we can pretend we have anything we wish. I have 8 roses = 5 roses + — roses. What have you?

Who can show us how to find 9 + — = 18?

**9 + 6**　　　　**9 + 5**

**1.** You know 10 + 6 = 16.

Will 9 + 6 be more or less than 10 + 6? 9 + 6 = ?

**2.** During one hour 9 trains going north and 6 going south pass through a certain village. How many trains go through it in that one hour?

**3.** Make other problems about 9 + 6.

**4.** You have just learned:

9 + 6 = 15. Then 9 + 5 = —?

**5.** Roger picked 9 qts. of cherries and 5 qts. of strawberries for his mother. How many qts. did he pick in all?

9 qts. + 5 qts. = — qts.

8 + 1 = ?　　3 + 6 = ?　　9 + 1 = ?　　5 + 5 = ?
7 + 6 = ?　　8 + 7 = ?　　7 + 9 = ?　　8 + 9 = ?

### WRITTEN EXERCISE

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 6 | 4 | **2.** | 9 | 2 | **3.** | 7 | 3 | **4.** | 8 | 3 |
| | +4 | +6 | | +2 | +9 | | +3 | +7 | | +3 | +8 |
| **5.** | 8 | 7 | **6.** | 7 | 6 | **7.** | 9 | 6 | **8.** | 9 | 5 |
| | +7 | +8 | | +6 | +7 | | +6 | +9 | | +5 | +9 |
| **9.** | 9 | 7 | **10.** | 9 | 4 | **11.** | 9 | 3 | **12.** | 9 | 8 |
| | +7 | +9 | | +4 | +9 | | +3 | +9 | | +8 | +9 |

### SUBTRACTION

| **6 − 1** | **7 − 4** | **8 − 2** | **9 − 5** |
|---|---|---|---|
| 4 + 5 = ? | 3 + 4 = ? | 2 + 6 = ? | 1 + 5 = ? |
| 9 − 5 = ? | 7 − 4 = ? | 8 − 2 = ? | 6 − 1 = ? |

**1.** If you have 9 cents and spend 5 cents for an ice cream cone, how many cents have you left?

9 − 5 = ?

**2.** There are — days in a week. When Sunday, Monday, Tuesday and Wednesday have passed, how many days are left?

7 days − 4 days = — days?

**3.** There were 8 children skipping rope. 2 came in at the first bell. How many were still on the playground?

8 children − 2 children = — children?

**4.** You were 6 years old when you entered school. How old were you the year before?

6 years − 1 year = — years?

The group cards described on p. 18 may be well used here. For example, take a card bearing 5 blue squares and 4 red ones. Hold up the card to show 5+4=9. Cover up the red squares. 9−4=5. Cover up the blue squares. 9−5=4.

### COMBINATIONS IN SUBTRACTION

**$3 - 1$ $7 - 3$ $10 - 6$**

$6 + 4 = ?$ $4 + 3 = ?$ $2 + 1 = ?$
$10 - 6 = ?$ $7 - 3 = ?$ $3 - 1 = ?$

**1.** Everett earned 10 cts. for weeding the pansy bed. He spent 6 cts. buying new ball bearings for his skates. How many cents had he left?

When one takes 6 out of 10 there are — left?

**2.** Mary, Ethel and Jane were making a seven-room house in the leaves. When they had made 3 rooms how many were still unfinished?

When one takes 3 out of 7 there are — left?

**3.** The cook gave them 3 potatoes to roast. They burned 1. How many were fit to eat?

**$1 - 1$ $6 - 2$ $9 - 3$**

$6 + 3 = ?$ $4 + 2 = ?$
$9 - 3 = ?$ $1 - 1 = ?$ $6 - 2 = ?$

**1.** 9 pencils need sharpening. When Stanley has sharpened 3, how many are still unsharpened?

9 pencils − 3 pencils = — pencils?

**2.** A man gave Dorothy a cent. She spent it right away. How much had she then?

1 cent − 1 cent = —?

**3.** There were 6 eggs in the ice chest. Mother used 2 for making cookies. How many were left?

6 eggs − 2 eggs = — eggs?

| **4 − 3** | **10 − 2** | **7 − 5** |
|---|---|---|
| 3 + 1 = ? | 8 + 2 = ? | 5 + 2 = ? |
| 4 − 3 = ? | 10 − 2 = ? | 7 − 5 = ? |

**1.** Franklin picked up 7 stones beside the lake and threw 5 of them in.

7 stones − 5 stones = — stones?

**2.** Josephine has 4 paper dolls to cut out of the Delineator. When she has cut out 3, how many are still uncut?

4 paper dolls − 3 paper dolls = — paper dolls?

**3.** Hold up all ten of your fingers. "Simon says, 'Thumbs down!'" How many fingers are still up?

10 fingers − 2 fingers = — fingers?

**4.** What problems can you make about:

| **5.** | **6.** | **7.** |
|---|---|---|
| 7 apples | 4 birds | 7 cents |
| −7 apples | −3 birds | −2 cents |

| **10 − 5** | **8 − 3** | **7 − 2** | **5 − 3** |
|---|---|---|---|
| 5 + 5 = ? | 5 + 3 = ? | 2 + 5 = ? | 2 + 3 = ? |
| 10 − 5 = ? | 8 − 3 = ? | 7 − 2 = ? | 5 − 3 = ? |

**1.** Hold up all the fingers on each hand. How many fingers are up? Put 5 down. How many are still up?

10 fingers − 5 fingers = — fingers?

**2.** Marion's father gave her 8 tulip bulbs for her little garden. 3 were pink. The rest were yellow. How many yellow tulips did she have?

8 tulips less 3 tulips = — tulips?

### COMBINATIONS IN SUBTRACTION

**3.** Who is now 7 years old? How old were you 2 years ago?

7 years − 2 years = — years?

**4.** Roxanne earned a nickel drying the dishes. She spent 3 cents. How much had she left?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **5.** | 10 | **6.** | 8 | **7.** | 7 | **8.** | 5 |
| | −5 | | −3 | | −2 | | −3 |

### A REVIEW LESSON

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 1 | **2.** | 5 | **3.** | 6 | **4.** | 7 | **5.** | 10 | **6.** | 7 | **7.** | 8 |
| | −1 | | −3 | | −2 | | −5 | | −6 | | −4 | | −3 |
| **8.** | 10 | **9.** | 9 | **10.** | 7 | **11.** | 10 | **12.** | 10 | **13.** | 10 | **14.** | 6 |
| | −2 | | −5 | | −3 | | −5 | | −3 | | −7 | | −4 |

For an explanation of the way to teach the following lessons see "Teaching Suggestions," p. 277.

I

7 + 3 = ?  6 + 4 = ?
10 − 7 = ?  10 − 6 = ?

Suggested material for problems: Feeding squirrels with nuts, ½ dozen pigeons on a roof, a boy building sand castles.

II

7 + 7 = ?  3 + 5 = ?  8 + 1 = ?  7 − 7 = ?
14 − 7 = ?  8 − 5 = ?  9 − 1 = ?  5 − 5 = ?

Suggested material for problems: Children roller-skating, playing "Run-Sheep-Run," "Hide-and-Seek" or "Pom-pom-pullaway," cents, marbles, tops in a circle, spinning in a ring, automobiles standing in front of a building.

### III

$$\begin{array}{lll} 7 + 2 = ? & \quad 4 + 1 = ? & \quad 7 + 1 = ? \\ 9 - 7 = ? & \quad 5 - 4 = ? & \quad 8 - 1 = ? \end{array}$$

Suggested material: Fingers, nickels, trains of cars, books on a shelf, problems written on the board, pictures to cut out, ships sailing from a harbor, clothes hanging from a line.

### IV

$$\begin{array}{llll} 3 + 6 = ? & \quad 2 + 8 = ? & \quad 1 + 5 = ? & \quad 2 + 3 = ? \\ 9 - 6 = ? & \quad 10 - 8 = ? & \quad 6 - 5 = ? & \quad 5 - 2 = ? \end{array}$$

Suggested material: 9 boys playing baseball, dime, nickel, ½ dozen bananas, kites flying, trains leaving a terminal station.

Without material, but using pegs or cubes if necessary, present each fact (for example, 8 − 1) by having the children answer these questions:

1. If you need 8 and have only 7, how many more do you need?

2. If you have 8 and take away 7, how many have you left?

### V

$$\begin{array}{r} 8 \\ -7 \\ \hline \end{array} \qquad \begin{array}{r} 10 \\ -9 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ -4 \\ \hline \end{array} \qquad \begin{array}{r} 10 \\ -4 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ -3 \\ \hline \end{array} \qquad \begin{array}{r} 10 \\ -8 \\ \hline \end{array}$$

Suggested material for applied problems: Kites flying, people on a street-car, children playing in a sand-pile, dime, nickel, birds in a tree, cows in a pasture, marbles in the ring, words written on the board, pennies in a bank, cookies in a plate.

### VI

$$\begin{array}{r} 10 \\ -10 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ -4 \\ \hline \end{array} \qquad \begin{array}{r} 7 \\ -1 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ -6 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ -2 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ -1 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ -2 \\ \hline \end{array} \qquad \begin{array}{r} 10 \\ -1 \\ \hline \end{array}$$

Suggested material: Dime, ½ dozen, days of week, gallon, pair, 9 stones, 9 eggs, 9 cents, people waiting for car on a corner, children making sand castles, apples in a dish, sticks for a fire.

## COMBINATIONS IN SUBTRACTION

### VII

$$\begin{array}{cccccccc} 9 & 8 & 9 & 8 & 7 & 5 & 3 & 4 \\ \underline{-8} & \underline{-7} & \underline{-2} & \underline{-6} & \underline{-6} & \underline{-1} & \underline{-2} & \underline{-1} \end{array}$$

Suggested material for applied problems: 9 boys ready to dive from a pier, 9 books on a shelf, 6 pigeons on a roof, days of week, the nickel, clothes on a line, loaves of bread in oven, people getting out of an elevator.

Note.—If concrete problems are desired, local data may be supplied for these lessons.

### I

$10 + 9 = ?$
$19 - 10 = ?$
$19 - 9 = ?$

$10 + 7 = ?$
$17 - 7 = ?$
$17 - 10 = ?$

$10 + 5 = ?$
$15 - 10 = ?$
$15 - 5 = ?$

### II

$9 + 8 = ?$
$17 - 9 = ?$
$17 - 8 = ?$

$10 + 3 = ?$
$13 - 3 = ?$
$13 - 10 = ?$

$10 + 1 = ?$
$11 - 10 = ?$
$11 - 1 = ?$

### III

$8 + 6 = ?$
$14 - 8 = ?$
$14 - 6 = ?$

$9 + 2 = ?$
$11 - 2 = ?$
$11 - 9 = ?$

$7 + 5 = ?$
$12 - 7 = ?$
$12 - 5 = ?$

### IV

$10 + 8 = ?$
$18 - 10 = ?$
$18 - 8 = ?$

$9 + 7 = ?$
$16 - 7 = ?$
$16 - 9 = ?$

$6 + 7 = ?$
$13 - 6 = ?$
$13 - 7 = ?$

### V

$10 + 6 = ?$
$16 - 10 = ?$
$16 - 6 = ?$

$9 + 9 = ?$
$18 - 9 = ?$

$5 + 9 = ?$
$14 - 5 = ?$
$14 - 9 = ?$

### VI

$10 + 4 = ?$
$14 - 10 = ?$
$14 - 4 = ?$

$7 + 7 = ?$
$14 - 7 = ?$

$9 + 6 = ?$
$15 - 6 = ?$
$15 - 9 = ?$

### VII

$9 + 4 = ?$
$13 - 9 = ?$
$13 - 4 = ?$

$10 + 2 = ?$
$12 - 10 = ?$
$12 - 2 = ?$

$8 + 3 = ?$
$11 - 3 = ?$
$11 - 8 = ?$

### VIII

$8 + 7 = ?$
$15 - 7 = ?$
$15 - 8 = ?$

$8 + 8 = ?$
$16 - 8 = ?$

$7 + 4 = ?$
$11 - 7 = ?$
$11 - 4 = ?$

$6 + 5 = ?$
$11 - 6 = ?$
$11 - 5 = ?$

### IX

$8 + 5 = ?$
$13 - 8 = ?$
$13 - 5 = ?$

$9 + 3 = ?$
$12 - 9 = ?$
$12 - 3 = ?$

$6 + 6 = ?$
$12 - 6 = ?$

$8 + 4 = ?$
$12 - 8 = ?$
$12 - 4 = ?$

## MULTIPLICATION

$$\begin{array}{r}2\\+2\\\hline\end{array}\qquad\begin{array}{r}8\\+8\\\hline\end{array}\qquad\begin{array}{r}5\\+5\\\hline\end{array}$$

1. How many 2's are there here? Two 2's are?
2. How many 8's are there here? Two 8's are?
3. How many 5's are there here? Two 5's are?

We may also write them in this way:

$$\begin{array}{r}2\\\times 2\\\hline\end{array}\qquad\begin{array}{r}8\\\times 2\\\hline\end{array}\qquad\begin{array}{r}5\\\times 2\\\hline\end{array}$$

They are read the same way. Two 2's are 4; two 8's are 16; two 5's are 10.

### NUMBER FACTS IN MULTIPLICATION

**4.** Robert has 2 pencils. Jane has twice as many. Jane has — pencils?

Two 2's = —?

**5.** Harold picked 5 quarts of strawberries and Ben picked twice as many. Ben picked — quarts?

Two 5's are —?

**6.** Margaret sharpened 8 pencils and John sharpened twice as many. John sharpened — pencils?

Two 8's are —?

$$\begin{array}{r} 3 \\ \times 3 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ \times 4 \\ \hline \end{array} \qquad \begin{array}{r} 1 \\ \times 1 \\ \hline \end{array}$$

How many 3's? Two 3's are?
How many 4's? Two 4's are?
How many 1's? Two 1's are?

**1.** Dorothy had 3 pennies and Janet had twice as many. Janet had — pennies?

Two 3's are —?

**2.** Make a problem using two 4's are 8.

**3.** Marion read 1 book. Ruth did twice as much reading. Ruth read — books?

$6 + 6 = ?$ Two 6's are —? $2 \times 6 = ?$
$9 + 9 = ?$ Two 9's are —? $2 \times 9 = ?$
$7 + 7 = ?$ Two 7's are —? $2 \times 7 = ?$
$10 + 10 = ?$ Two 10's are —? $2 \times 10 = ?$

Two 7's = ? Two 6's = ? Two 10's = ? Two 9's = ?
Two 3's = ? Two 4's = ? Two 5's = ? Two 8's = ?

### DIVISION BY TWO

**1.** Roberta wished to help her mother. Mother said, "You may sort the stockings in my sewing basket by pairs." Roberta found 18 stockings in the basket. How many pairs were there?

$$18 \div 2 = ?$$

**2.** Then Roberta put in order the hall clothes-closet. The boys had thrown roller skates and rubbers right on the floor. She found 6 skates and put them neatly side by side in pairs. How many pairs were there?

$$6 \div 2 = ?$$

**3.** There were 10 rubbers of different sizes. When Roberta had matched them, there were — pairs?

$$10 \div 2 = ?$$

**4.** After that she went to the box where her shoes and sister Jane's were kept. Slippers, pumps, and shoes! Roberta counted 16 altogether. They made — pairs.

$$16 \div 2 = ?$$

**5.** Then she looked in the boys' ward-robe. The shoes were very untidy. She took all 8 of them out and put them neatly back in — pairs.

$$8 \div 2 = ?$$

**6.** Mother's glove box was in good order, but Roberta took out the 12 gloves any way, and put them back again. How many pairs were in the box?

$$12 \div 2 = ?$$

These problems are all *measuring* problems in division. Since this is the kind of division which usually gives children trouble in applied problems, give enough additional work to develop the idea of measuring one number by another.

### NUMBER FACTS

**7.** Then some children came and asked Roberta to come out and play. Mother said, "You may have 2 cookies apiece, because Roberta has helped me so much." She gave Roberta 14 cookies. How many children were there?

$$14 \div 2 = ?$$

The 45 number facts in addition, all of which have been studied separately in the preceding lessons, are presented below in a combined table.

$$\begin{array}{ccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} \end{array}$$

$$\begin{array}{cccccccc} 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} \end{array}$$

$$\begin{array}{ccccccc} 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} \end{array}$$

$$\begin{array}{cccccc} 4 & 5 & 6 & 7 & 8 & 9 \\ \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} \end{array}$$

$$\begin{array}{ccccc} 5 & 6 & 7 & 8 & 9 \\ \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{5} \end{array}$$

$$\begin{array}{cccc} 6 & 7 & 8 & 9 \\ \underline{6} & \underline{6} & \underline{6} & \underline{6} \end{array}$$

$$\begin{array}{ccc} 7 & 8 & 9 \\ \underline{7} & \underline{7} & \underline{7} \end{array}$$

$$\begin{array}{cc} 8 & 9 \\ \underline{8} & \underline{8} \end{array}$$

$$\begin{array}{c} 9 \\ \underline{9} \end{array}$$

Pages 19 to 45 are arranged to provide an adequate amount of drill to prepare pupils for a comprehensive study of the fundamental processes.

If the children do not know these facts, it will save time to stop and teach them before beginning the third grade work in addition and subtraction. Pupils who have not mastered the fundamental facts can never become accurate and quick in the use of the fundamental processes.

# ADDITION

## ADDITION WITH THE ONES

You have learned 45 combinations or addition facts. In learning these, you "skipped about." Now try writing them in regular order, as here shown:

1 + 1 =

1 + 2 =
1 + 3 =
1 + 4 =
1 + 5 =
1 + 6 =
1 + 7 =
1 + 8 =
1 + 9 =
1 + 10 =

2 + 1 =
3 + 1 =
4 + 1 =
5 + 1 =
6 + 1 =
7 + 1 =
8 + 1 =
9 + 1 =
10 + 1 =

### Problems for Oral Solution

**1.** There are 9 boys in a baseball team. The team and the umpire are how many boys?

**2.** An Indian had 8 arrows in his quiver and 1 in his bow. How many arrows had he?

**3.** Lucile found 7 red roses in her garden and 1 white rose. How many roses did she find in all?

**4.** When Robinson Crusoe took Friday to his lonesome cave, how many men were there?

**5.** There are 6 teaspoons in a set. One set and one spoon are how many spoons?

## ADDITION WITH THE TWOS

Write and complete the addition table of 2's thru 2 + 10.

2 + 1 =
2 + 2 =
2 + =
2 + =
2 + =

2 + 6 =
2 + =
2 + =
2 + =
2 + =

Now write the table in this order.

1 + 2 =
2 + 2 =
+ 2 =
+ 2 =
+ 2 =

6 + 2 =
+ 2 =
+ 2 =
+ 2 =
+ 2 =

### Problems for Oral Solution

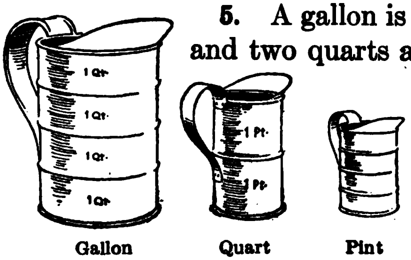
1. There are 2 flowers in one vase, and 5 in another. How many flowers are there in both?

2. Henry has 4 marbles, and Robert has 2. How many do they have in all?

3. George catches 2 fish, and Frank catches 6. How many fish do they catch in all?

4. Edwin pays 2 cents for stamps, and 7 cents for picture cards. How much does he pay for the stamps and cards?

The problems given in a textbook are necessarily of a general character, adapted to all schools. Only the teacher, or the pupils themselves, can supply problems with a local setting, such as relate to the things most familiar to the children of each locality. Several problems of this kind, especially for oral solution, should be called for from the pupils, or given by the teacher, at each lesson.


1 Qt.
1 Qt.
1 Qt.
1 Qt.
1 Pt.
1 Pt.
Gallon
Quart
Pint

**5.** A gallon is four quarts. One gallon and two quarts are how many quarts?

**6.** A quart is two pints. A quart and one pint are how many pints?

**7.** A nickel is 5 cents. A nickel and 2 cents are how many cents?

**8.** A dime is 10 cents. A dime and 2 cents are how many cents?

### Written Practice with the 2's

Copy this table of the 2's in the following *vertical* form. At the bottom of each column write the sum.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Copy the table of the 2's in this order and write the sum under each column.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

### Test Problems in Addition

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 2 | **2.** | 5 | **3.** | 7 | **4.** | 1 | **5.** | 9 | **6.** | 2 | **7.** | 5 |
| | 3 | | 1 | | 0 | | 6 | | 0 | | 5 | | 2 |
| | 4 | | 3 | | 2 | | 4 | | 3 | | 4 | | 6 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **8.** | 43 | **9.** | 24 | **10.** | 63 | **11.** | 49 | **12.** | 67 |
| | 56 | | 35 | | 25 | | 30 | | 32 |

To vary this *seat work* the teacher may ask the pupils to copy these numbers in irregular order and write the answers, after they have successully copied them in the order here given and found the answers.

## ADDITION WITH THE THREES

Write and complete the addition table of 3's thru 3 + 10.

3 + 1 =
3 + =
3 + =
3 + =
3 + =

3 + 6 =
3 + =
3 + =
3 + =
3 + =

Write the table in this order.

1 + 3 =
2 + 3 =
+ 3 =
+ 3 =
+ 3 =

6 + 3 =
+ 3 =
+ 3 =
+ 3 =
+ 3 =

### Problems for Oral Solution

**1.** Arthur saves 6 dimes, and his brother saves 3. How many dimes do they save?

**2.** Three parcels are sent by express, and 5 by parcel post. How many are sent in all?

**3.** One nest has 3 eggs, and another has 9. How many eggs do the nests have?

**4.** Eight boys form a club, and 3 more boys join it. How many members has the club?

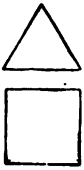
**5.** There are 3 oak trees in one field, and 10 in another. How many are there in these fields?

**6.** In one city office there are 3 typewriters, and in another there are 4. How many typewriters are there in the offices?

7. One desk has 2 drawers, and another has 9. How many drawers do the desks have?

8. Seven days make one week. A week and 3 days are how many days?

9. A triangle has 3 sides, and a square has 4 sides. How many sides do they have in all?



### Written Practice with the 3's

Copy this table of the 3's in the vertical form, and write the sum of the numbers under each column.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Write the table of the 3's in this order.

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Give the missing numbers in this addition table:

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | ? | 6 | ? | 8 | ? | 10 |
| ? | 3 | ? | 3 | ? | 3 | ? |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |

Make an addition problem using 3 and some other number.

### Test Problems

Add from the top down.

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 3 | **2.** | 3 | **3.** | 6 | **4.** | 4 | **5.** | 6 | **6.** | 4 | **7.** | 7 | **8.** | 2 |
| | 4 | | 2 | | 3 | | 3 | | 2 | | 2 | | 2 | | 4 |
| | 2 | | 4 | | 0 | | 2 | | 1 | | 0 | | 9 | | 2 |
| | 6 | | 7 | | 8 | | 5 | | 4 | | 9 | | 1 | | 7 |

Write in a column and add: 2, 1, 4, 2, 6.

## ADDITION WITH THE FOURS

Write the addition table of the 4's through 4 + 10.

4 + 1 =
? + ? =
? + ? =
? + ? =
? + ? =

4 + 6 =
? + ? =
? + ? =
? + ? =
? + ? =

### Problems for Oral Solution

1. Four boys and 5 boys are how many boys?

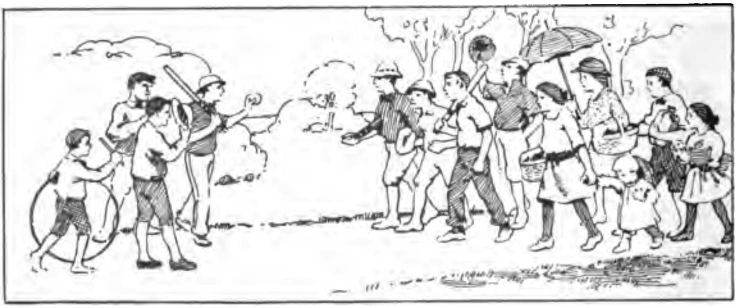
2. One boat has 4 oars, and another 6. How many oars have they in all?

3. Annie is 4 years old, and Jessie is 8. What is the sum of their ages?

4. George catches 7 sunfish and 4 bass. How many fish does he catch?

5. A lady has eight flowerpots and buys four more. How many has she in all?

6. If 4 children in a park meet 9 other children, how many children meet together?



**7.** A trolley car goes north 4 blocks, and then east 3 blocks. How many blocks does it go?

**8.** One city flat contains 8 rooms, and another contains 4. How many rooms are there in the flats?

### Written Practice With the 4's

Copy this table of the 4's in the vertical form and write the sum of the numbers under each column.

$$\begin{array}{cccccccc} 4 & 4 & 4 & 4 & 4 & 4 & 4 & 4 \\ \underline{3} & \underline{4} & \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Copy the numbers in the other, or reverse order and write their sums.

$$\begin{array}{ccccccc} 3 & 5 & 6 & 7 & 8 & 9 & 10 \\ \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} \end{array}$$

Give the missing numbers in this addition table:

$$\begin{array}{ccccccc} ? & 4 & ? & 6 & ? & 8 & 10 \\ \underline{4} & \underline{?} & \underline{4} & \underline{?} & \underline{4} & \underline{?} & \underline{?} \\ 9 & 8 & 11 & 10 & 13 & 12 & 14 \end{array}$$

Make a problem using the number 4 and one other number and give their sum.

### Test Problems

Find the sum of these numbers:

$$\begin{array}{rrrrrrrrrrrrrrrr} \textbf{1.} & 4 & \textbf{2.} & 5 & \textbf{3.} & 6 & \textbf{4.} & 4 & \textbf{5.} & 5 & \textbf{6.} & 2 & \textbf{7.} & 1 & \textbf{8.} & 6 \\ & 3 & & 2 & & 1 & & 4 & & 3 & & 6 & & 7 & & 0 \\ & \underline{6} & & \underline{8} & & \underline{5} & & \underline{5} & & \underline{7} & & \underline{9} & & \underline{8} & & \underline{7} \end{array}$$

$$\begin{array}{rrrrrrrrrr} \textbf{9.} & 341 & \textbf{10.} & 724 & \textbf{11.} & 649 & \textbf{12.} & 475 & \textbf{13.} & 705 \\ & \underline{208} & & \underline{135} & & \underline{230} & & \underline{123} & & \underline{293} \end{array}$$

## ADDITION WITH THE FIVES

Build the tables of the 5's in the same way the tables of the 4's, the 3's, and the 2's were built.

### Problems for Oral Solution

**1.** A nickel and 5 cents are how many cents?

**2.** If you travel 5 miles by land and 4 miles by water, how far do you go?

**3.** Mary has 5 white chickens, and 10 black chickens. How many chickens has she?

**4.** A motorcyclist rode 5 miles north and 8 miles east. How many miles did he ride?

**5.** The mail carrier delivered at one house 5 letters and 3 at another. How many letters did he deliver?

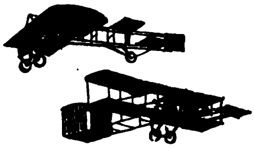
**6.** There are 5 books on one shelf, and 6 on another shelf. How many books are there on the two shelves?

**7.** Frank has 5 white rabbits, and his sister Minnie has 3 Maltese kittens, for pets. How many pets have they?

**8.** In one restaurant there are 9 tables, and in another there are 5. How many tables are there in the two restaurants?

**9.** There are 5 trolley cars on one street car line and 6 on another. How many trolley cars are there on both of these lines?

**10.** In one county there are 5 telegraph stations, and in another there are 7. How many telegraph stations are there in these two counties?



**11.** We saw 5 flying machines on Monday and 4 on Tuesday. How many did we see in all?

**12.** One nickel and 7 cents are how many cents?

### Written Practice with the 5's

See how quickly and how neatly you can copy this table of the 5's and write the sums.

$$\begin{array}{cccccc} 5 & 5 & 5 & 5 & 5 & 5 \\ \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Copy in the reverse order and write the sums.

$$\begin{array}{ccccc} 6 & 7 & 8 & 9 & 10 \\ \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{\phantom{1}5} \end{array}$$

In the last column why do you place the 5 directly under the right hand figure?

Give the missing numbers in this addition table:

$$\begin{array}{cccccc} 6 & ? & 8 & ? & 10 & ? \\ \underline{?} & \underline{5} & \underline{?} & \underline{5} & \underline{?} & \underline{5} \\ 11 & 10 & 13 & 12 & 15 & 14 \end{array}$$

Make an addition problem using 5 and one other number, and give their sum.

### Test Problems

Add from the bottom up.

$$\begin{array}{llllllll} \textbf{1.}\ 9 & \textbf{2.}\ 1 & \textbf{3.}\ 8 & \textbf{4.}\ 6 & \textbf{5.}\ 1 & \textbf{6.}\ 1 & \textbf{7.}\ 1 & \textbf{8.}\ 1 \\ \phantom{\textbf{1.}}\ 3 & \phantom{\textbf{2.}}\ 6 & \phantom{\textbf{3.}}\ 1 & \phantom{\textbf{4.}}\ 3 & \phantom{\textbf{5.}}\ 9 & \phantom{\textbf{6.}}\ 6 & \phantom{\textbf{7.}}\ 9 & \phantom{\textbf{8.}}\ 4 \\ \phantom{\textbf{1.}}\ 2 & \phantom{\textbf{2.}}\ 4 & \phantom{\textbf{3.}}\ 5 & \phantom{\textbf{4.}}\ 0 & \phantom{\textbf{5.}}\ 1 & \phantom{\textbf{6.}}\ 3 & \phantom{\textbf{7.}}\ 3 & \phantom{\textbf{8.}}\ 1 \\ \phantom{\textbf{1.}}\ \underline{1} & \phantom{\textbf{2.}}\ \underline{3} & \phantom{\textbf{3.}}\ \underline{2} & \phantom{\textbf{4.}}\ \underline{4} & \phantom{\textbf{5.}}\ \underline{3} & \phantom{\textbf{6.}}\ \underline{2} & \phantom{\textbf{7.}}\ \underline{5} & \phantom{\textbf{8.}}\ \underline{2} \end{array}$$

### ADDITION WITH THE SIXES

Build the table of the 6's through 6 + 10 as you have been shown.

#### Problems for Oral Solution

1. Six flags and 9 flags are how many flags?

2. On a shelf there are 6 books. If I add 4 more how many will there be?

3. There are 6 oak trees and 7 maples in a grove. How many trees are there?

4. A livery man had 8 horses, and bought 6 more. How many did he have then?

5. One hen has 10 chickens, and another has 6. How many chickens do the hens have?

6. One pasture contains 9 acres, and another contains 6. How many acres do both contain?

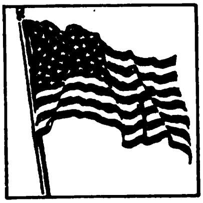
7. There are 7 bridges in one city, and 6 in another. How many are there in the two cities?

8. If a boy enters school at the age of 6 and remains 8 years in school, how old will he be then?

9. In a pasture are 6 cows standing, and 6 more lying down. How many cows are there in all?

10. Here are 6 Berkshire pigs, and 5 Chester Whites. How many pigs are there in all?

**11.** At a hotel there are 6 arrivals from the east, and 9 from the west. How many arrivals are there in all from these directions?



**12.** Our flag has 7 red stripes and 6 white stripes. How many stripes has it?

**13.** One year a river rose 8 feet above low water, and another year it rose 6 feet higher. How high did it rise the second year?

### Written Practice with the 6's

Copy this table of the 6's as given below and write the sum under each column.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 6 | 6 | 6 | 7 | 8 | 9 | 10 |
| 7 | 8 | 9 | 10 | 6 | 6 | 6 | 6 |

Find the missing numbers in this addition table:

| | | | |
|---|---|---|---|
| 8 | ? | 10 | ? |
| ? | 6 | ? | 6 |
| 14 | 12 | 16 | 15 |

See if you can make two problems, in each one using the number 6 and some other number, and give their sums.

### Test Problems

| | | | | | |
|---|---|---|---|---|---|
| **1.** 32 | **2.** 24 | **3.** 76 | **4.** 45 | **5.** 71 | **6.** 62 |
| 41 | 32 | 2 | 23 | 25 | 11 |
| 25 | 13 | 20 | 21 | 3 | 24 |

| | | | | |
|---|---|---|---|---|
| **7.** 121 | **8.** 145 | **9.** 274 | **10.** 468 | **11.** 296 |
| 402 | 303 | 120 | 500 | 500 |
| 264 | 430 | 604 | 31 | 203 |

## ADDITION WITH THE SEVENS

Build the table of the 7's through 7 + 10 as you have been shown.

### Problems for Oral Solution

1. Samuel has 7 white lambs, and 5 black ones. How many lambs has he?

2. A certain factory uses 7 circular saws and 8 band saws. How many saws does it use?

3. A plantation has 10 draft horses, and 7 saddle horses. How many horses are there?

4. Julia painted ten Easter cards, and Helen painted 7. How many did they paint?

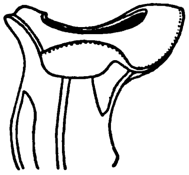
5. A dairyman has 9 cows in one pasture and 7 in another. How many cows has he in all?

6. A party of 7 Boy Scouts signaled to another party of 6. How many Boy Scouts were there in all?

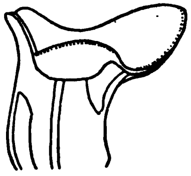
7. Josephine picked 7 baskets of currants, and 4 baskets of gooseberries. How many baskets of berries did she pick in all?

8. In a railway coach seven passengers have sanitary drinking cups, and the nine others are without. How many passengers are there in the coach?

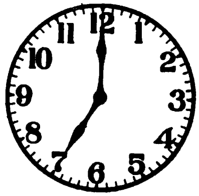
9. In a hunting party, 7 of the men used the humane McClellan saddles, and the other 8 men used common saddles. How many saddles were there in the party?



McClellan saddle



Common saddle



**10.** In this picture the clock hands point to 7 o'clock. If they could move, in 2 hours they would be pointing to —— o'clock?

**11.** In 4 hours, they would show —— o'clock? In 3 hours? In 5 hours?

**12.** There are 7 days in a week. How many days are there in 2 weeks?

**The topic of telling time and the clock face with Roman numerals are given on p. 140. These topics may be taught sooner if your course of study requires them.**

### Written Practice with the 7's

Copy this table of the 7's and write the sum under each column.

| | | | | | |
|---|---|---|---|---|---|
| 7 | 7 | 7 | 8 | 9 | 10 |
| 8 | 9 | 10 | 7 | 7 | 7 |

Give the missing numbers in this addition table:

| | | | | | | |
|---|---|---|---|---|---|---|
| ? | 8 | 7 | ? | 7 | 10 | ? |
| 7 | ? | ? | 7 | ? | ? | 7 |
| 12 | 15 | 14 | 16 | 10 | 17 | 13 |

See how quickly and how neatly you can make a problem using the number seven and one other number, and write their sum.

### Test Problems

Add from the top down.

| **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** |
|---|---|---|---|---|---|---|---|
| 2 | 4 | 1 | 4 | 3 | 6 | 5 | 1 |
| 4 | 5 | 4 | 2 | 4 | 0 | 3 | 0 |
| 3 | 1 | 3 | 7 | 2 | 3 | 9 | 2 |
| 7 | 6 | 5 | 1 | 4 | 1 | 1 | 6 |

## ADDITION WITH THE EIGHTS AND NINES

Build the table of the 8's and 9's through 9 + 10 as you have been shown.

### Problems for Oral Solution

**1.** Nine clothespins and 8 clothespins are how many clothespins?

**2.** Harold has 7 large ducks and 8 small ducks. How many ducks has he?

**3.** The clerks of a department store include 8 women and 6 men. How many clerks are there?

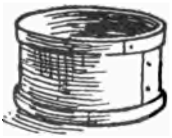
**4.** Victor caught 8 crawfish in a stream, and 5 in a pond. How many did he catch in all?

**5.** In a high school graduating class there are 10 girls and 8 boys. How many graduates are there in all?

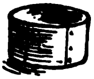
**6.** At the age of 10, Roy went to live with his uncle, with whom he remained for 9 years. How old was Roy at the end of that time?

**7.** A peck is 8 quarts. A peck and 7 quarts are how many quarts?

Bushel Basket



Peck Measure

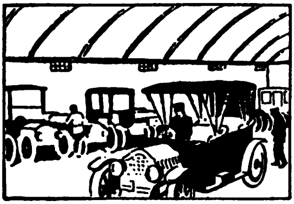


Quart

Pint

**8.** How many articles can you name that are usually measured in a bushel basket? In a peck measure? In a quart measure? In a pint measure?

**9.** Frank pays 10 dollars for clothing and 8 for railway fare. How much does he pay in all?



**10.** One garage[1] employs 10 chauffeurs[2] and another employs 9. How many do the two garages employ?

### Written Practice with the 8's and 9's

Copy this combined table of 8's and 9's and write the sum under each column.

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | 8 | 8 | 9 | 9 | 9 | 10 |
| 8 | 9 | 10 | 9 | 10 | 8 | 8 |

Find the missing numbers in this addition table:

| | | | | | |
|---|---|---|---|---|---|
| 8 | ? | 10 | ? | 9 | 10 |
| ? | 8 | ? | 8 | ? | ? |
| 16 | 17 | 18 | 17 | 18 | 19 |

See how interesting a problem you can write, using 8 as one of the numbers and 9 as the other number, and give their sum.

### Test Problems

Find the sums of the following:

| | | | | |
|---|---|---|---|---|
| **1.** 124 | **2.** 365 | **3.** 274 | **4.** 638 | **5.** 357 |
| 935 | 421 | 503 | 440 | 510 |
| 640 | 613 | 821 | 211 | 132 |
| **6.** 643 | **7.** 964 | **8.** 175 | **9.** 246 | **10.** 659 |
| 225 | 821 | 821 | 132 | 710 |
| 321 | 104 | 903 | 920 | 230 |

---

[1] Pronounced gȧ-räzh. Pronounced Shō-fūr.

### ADDING BY GROUPS

Add the following by combining the numbers as shown:

$$
\begin{array}{r}5\\ \left.\begin{array}{r}3\\2\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}5\\ \left.\begin{array}{r}7\\3\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}5\\ \left.\begin{array}{r}8\\2\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}5\\ \left.\begin{array}{r}9\\1\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}5\\ \left.\begin{array}{r}2\\2\\1\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}\left.\begin{array}{r}2\\3\end{array}\right\}\\ \left.\begin{array}{r}3\\2\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}\left.\begin{array}{r}7\\3\end{array}\right\}\\ \left.\begin{array}{r}8\\2\end{array}\right\}\\ \hline\end{array}
\quad
\begin{array}{r}\left.\begin{array}{r}9\\1\end{array}\right\}\\ \left.\begin{array}{r}3\\7\end{array}\right\}\\ \hline\end{array}
$$

In these problems, show, as above, the numbers you could group in adding. Then add, using these groups:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 4 | 6 | 1 | 3 | 4 | 7 | 6 |
| 3 | 2 | 4 | 3 | 2 | 6 | 3 | 0 |
| 6 | 5 | 2 | 3 | 1 | 2 | 2 | 5 |
| 4 | 3 | 5 | 3 | 9 | 3 | 5 | 5 |

Add by groups as much as you can:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 42 | **2.** | 67 | **3.** | 81 | **4.** | 76 | **5.** | 61 | **6.** | 92 |
| | 61 | | 41 | | 70 | | 30 | | 51 | | 33 |
| | 82 | | 60 | | 54 | | 42 | | 43 | | 72 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **7.** | 123 | **8.** | 732 | **9.** | 942 | **10.** | 720 | **11.** | 904 | **12.** | 423 |
| | 633 | | 832 | | 143 | | 345 | | 164 | | 644 |
| | 442 | | 225 | | 513 | | 612 | | 821 | | 432 |

| | | |
|---|---|---|
| 2 | 9 | 4 |
| 7 | 5 | 3 |
| 6 | 1 | 8 |

The Magic Square

Prove that in the magic square the figures in every row, if added, will equal fifteen. The rows may be added up and down, or right and left, or cornerwise.

Rule a piece of paper, 6 inches square, in three equal columns each way. Number each small square as here shown. Cut the large square (along the ruled lines) into nine small squares. Mix them up and then rearrange (without consulting the book) so that the sum of the columns each way will be 15. This will afford an interesting game for both school and home.

## For Blackboard and Desk

| A | VI | VII | VIII | IX | X | D |
|---|---|---|---|---|---|---|
| V | 2 | 7 | 8 | 4 | 3 | |
| IV | 8 | 3 | 6 | 2 | 9 | |
| III | 5 | 8 | 5 | 4 | 7 | |
| II | 2 | 7 | 4 | 9 | 6 | |
| I | 3 | 5 | 1 | 6 | 1 | |
| C | | | | | | B |

**1.** Add the numbers in columns VI to X up. Prove the results by adding the same columns down.

**2.** Add the numbers in the rows I to V from left to right. Prove the results by adding from right to left.

**3.** When a class is able to add the numbers in the vertical and horizontal lines speedily and correctly, practice in like manner may be given on the numbers in the diagonal lines from A to B and from C to D. These diagonal lines should be traced with a pointer. This table presents the principal number combinations in addition and the arrangement provides for the easy addition of numbers by groups as illustrated on the preceding page.

*Use the blackboard freely.* A device such as this on the board furnishes a good beginning for recitations, as well as a means of using odd moments during the day, which otherwise might be wasted. The time of the drill should be shortened as the children become more proficient.

Exercises I and II, p. 256, may be used here for additional practice, by omitting the time-test, which should be deferred until the next grade.

## REVIEW PRACTICE IN ADDITION—ORAL AND WRITTEN.

### I.

Give orally the sums of the following:

$1 + 3 + 8 + 9 =$
$1 + 4 + 7 + 9 =$
$1 + 5 + 6 + 9 =$
$1 + 5 + 7 + 8 =$
$2 + 3 + 7 + 9 =$
$2 + 4 + 6 + 9 =$
$2 + 4 + 7 + 8 =$
$2 + 5 + 6 + 8 =$
$3 + 4 + 5 + 9 =$
$3 + 4 + 6 + 8 =$
$3 + 5 + 6 + 7 =$

### II.

Write two numbers which added equal 5; equal 7; 9; 11; 18; 17; 14; 20.

### III.

How many different pairs of numbers can you find which added equal 6; equal 10; equal 15; equal 12.

### IV.

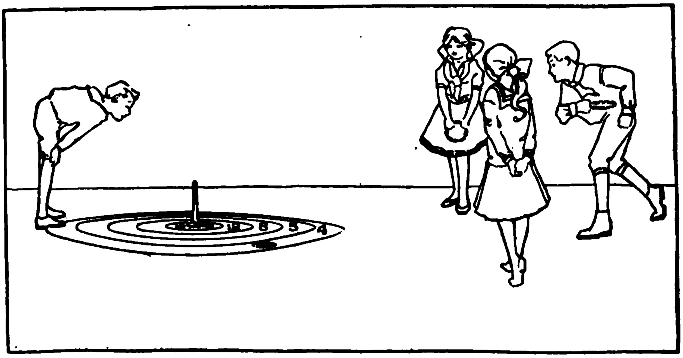
Write three different numbers which added equal 8; equal 15; equal 10; equal 16; equal 20.

### V.

Write four different numbers whose sum is 20; is 12; is 18; is 13; is 17.

## THE RING-TOSS GAME

### I



1. These children are playing ring-toss. It is something like the game of quoits played with a stake and horseshoe. "Ringing" the post counts 20 points. How much does tossing into each circle count?

2. In this game each child had three throws. These are their scores. Whose is the highest?

| Richard | Gene | Edwin | Betty |
|---|---|---|---|
| 16 | 12 | 4 | 5 |
| 20 | 8 | 4 | 5 |
| 4 | 20 | 12 | 20 |

**The adding of these scores necessitates the introduction of what is called "carrying" the ten. When the children try to find whose score is the highest, they will discover they do not know how. This desire to "know how" is the teacher's cue to give them the information they need in order to find who has won the game.**

**When the sum of the units column is found to be 10, the teacher may simply state that 10 ones = 1 ten, and that the 1 ten must be added to the other tens.**

**Additional problems for drill on this type are found on p. 70, I.**

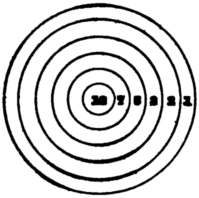
**The problems on p. 66 are also of this type: having the sum of the units column equal to 1 ten.**

### THE RING-TOSS GAME

Find the sums of these columns written like ring-toss scores.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|
| 12 | 16 | 25 | 27 | 34 | 17 | 12 | 33 |
| 3 | 20 | 3 | 13 | 6 | 2 | 35 | 3 |
| 24 | 51 | 50 | 30 | 20 | 51 | 23 | 24 |
| 41 | 3 | 2 | 10 | 10 | 12 | 16 | 10 |

Here is another numbering of the rings. Those who can, may make up some scores from this picture. Choose names for the children you pretend are playing, and find out who has the highest score. Have the sum in each units column equal to 10.



If you would rather, you may add these ready-made scores, instead.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|
| 10 | 41 | 25 | 10 | 43 | 32 | 45 | 77 |
| 25 | 43 | 30 | 53 | 25 | 23 | 21 | 71 |
| 63 | 35 | 25 | 77 | 40 | 52 | 22 | 82 |
| 42 | 41 | 60 | 20 | 12 | 73 | 52 | 10 |

| 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---|---|---|---|---|---|---|---|
| 25 | 34 | 52 | 61 | 18 | 93 | 82 | 33 |
| 66 | 34 | 73 | 40 | 30 | 30 | 42 | 23 |
| 74 | 10 | 10 | 69 | 70 | 27 | 10 | 62 |
| 51 | 22 | 15 | 20 | 52 | 60 | 56 | 82 |

Write in columns and add:

**1.** 102 + 324 + 234

**2.** 412 + 233 + 125

**3.** 364 + 105 + 321

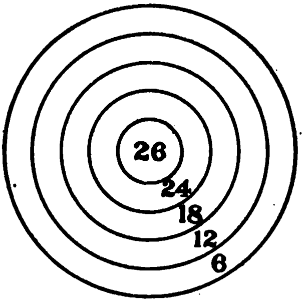
**4.** 126 + 154 + 400

**5.** 421 + 100 + 115 + 214

**6.** 312 + 524 + 303 + 451

### THE BEANBAG GAME

### II.



With string and a piece of chalk make five circles on the floor. Let each pupil who plays today have four turns at throwing a beanbag into the "ring." Each one who plays should have a place at the board where his scorekeeper may write the "points" he makes, like this:

10
2
22
10
—

When five children have had a chance, see who has made the greatest number of points.

Find the sums:

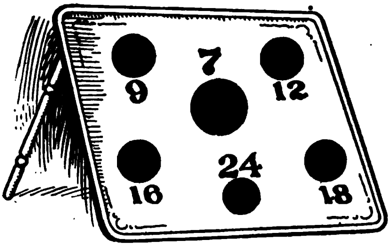
| **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|
| 34 | 57 | 28 | 61 | 87 | 32 |
| 43 | 62 | 42 | 39 | 24 | 94 |
| 10 | 85 | 54 | 76 | 11 | 45 |
| 62 | 24 | 33 | 52 | 68 | 23 |
| 45 | 13 | 27 | 45 | 23 | 68 |

The adding of these scores gives sums in the unit columns equal to more than 10, and usually in the teens. The *only new point* is the reduction of the sum to tens and units. The bundle of ten sticks may be used to represent the 10, if illustrative material seems necessary.

Additional problems for drill on this type are found on p. 70, II.

### WRITTEN ADDITION

### 111



With this board,[1] play the beanbag game another way.

1. Who in the class can make the highest score, having four turns? Having five turns?

2. Who can make the highest score in six turns—three turns at a time?

3. Who can make the highest score in seven turns?

4. Choose the five who have made the best records and give them at least 8 turns to find the champion thrower.

5. Divide the class into several teams, according to the number of children in it. Have a tournament to find which is the best team.

**Each score should be carefully added and understood before proceeding with the game. Plan other divisions of the turns until the "score" additions have supplied ample drill on double columns up to eight figures high. Do not hurry this work. It will require time to give all pupils their proper chance.**

Write in columns to add:

1. 16+9+25+17+10+21+42+6.
2. 24+10+7+13+5+27+43+7.
3. 41+5+26+30+2+43+16+5.
4. 35+23+61+5+3+21+30+8.

---

[1] See page 273 for fuller explanation of this board.

## THE BEANBAG GAME

Make a drawing of a beanbag board. Use these numbers for the holes: 16, 22, 28, 37, 49, 55. Suppose six children had been playing, each one having 4 turns. Write the scores they might have made. If you do not like these names, use others.

| **Mary** | **Alice** | **Philip** | **Louise** | **Jack** | **Ernest** |
|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? |

| **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** |
|---|---|---|---|---|---|---|---|
| 128 | 16 | 337 | 22 | 55 | 49 | 16 | 455 |
| 216 | 249 | 622 | 216 | 837 | 737 | 216 | 22 |
| 49 | 22 | 16 | 55 | 22 | 28 | 55 | 637 |
| 216 | 516 | 155 | 416 | 216 | 816 | 349 | 28 |
| 322 | 55 | 28 | 16 | 22 | 49 | 22 | 916 |
| 448 | 122 | 49 | 23 | 155 | 416 | 116 | 49 |

The purpose of this beanbag work is to motivate more difficult work in addition.

In the previous work no problems have occurred in which reduction of 10's to hundreds was necessary. If "carrying" the ten has been carefully taught, this similar case of "carrying" from tens to hundreds column, and from hundreds to thousands column is easily presented.

Additional problems for drill on this type are given on p. 70, III.

Copy in columns and add:

**1.** 2304 + 647 + 3624 + 26.
**2.** 1742 + 329 + 1280 + 8012.
**3.** 5264 + 1242 + 650 + 1795.
**4.** 7624 + 1564 + 424 + 2037.

## DRILL PROBLEMS IN WRITTEN ADDITION

I.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|
| 23 | 15 | 40 | 65 | 72 | 51 | 46 | 37 |
| 84 | 20 | 13 | 10 | 31 | 64 | 30 | 10 |
| 30 | 43 | 20 | 31 | 35 | 21 | 22 | 52 |
| 42 | 21 | 36 | 53 | 71 | 33 | 51 | 60 |

II.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|
| 26 | 75 | 49 | 36 | 72 | 64 | 43 | 72 |
| 34 | 22 | 23 | 85 | 67 | 79 | 38 | 39 |
| 45 | 44 | 30 | 43 | 96 | 22 | 52 | 25 |
| 83 | 26 | 26 | 55 | 35 | 51 | 43 | 81 |

| 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---|---|---|---|---|---|---|---|
| 71 | 67 | 45 | 86 | 57 | 59 | 43 | 87 |
| 49 | 82 | 37 | 43 | 19 | 62 | 67 | 93 |
| 36 | 49 | 64 | 55 | 78 | 81 | 53 | 49 |
| 84 | 38 | 91 | 72 | 63 | 47 | 92 | 61 |

III.

| 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|
| 182 | 241 | 362 | 190 | 387 | 378 |
| 123 | 115 | 334 | 536 | 120 | 460 |
| 450 | 580 | 443 | 200 | 442 | 130 |
| 204 | 423 | 620 | 133 | 610 | 512 |

| 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|
| 126 | 783 | 645 | 336 | 129 | 177 |
| 475 | 229 | 762 | 254 | 383 | 281 |
| 831 | 116 | 405 | 142 | 862 | 735 |

| 13. | 14. | 15. | 16. | 17. | 18. |
|---|---|---|---|---|---|
| 169 | 174 | 129 | 393 | 234 | 247 |
| 275 | 523 | 376 | 427 | 369 | 454 |
| 484 | 387 | 243 | 569 | 776 | 688 |
| 727 | 899 | 457 | 286 | 258 | 167 |
| 835 | 741 | 563 | 374 | 342 | 523 |

### MISCELLANEOUS PRACTICE PROBLEMS

**1.** Janet, Lucile and Margaret each had a bouquet of 24 roses. How many roses were there in all?

**2.** Charles is 11 years old, Mary is 14, Florence is 6, and Herbert is 9. This makes how many years?

**3.** Harry saved 25 cents one week, 20 cents the next week, and 55 cents the next. How much did he save?

**4.** Paul's hens laid 8 eggs on Monday, 12 on Tuesday, 9 on Wednesday, and 11 on Thursday. How many eggs were laid in the four days?

**5.** A fisherman, one day, caught 17 fish, another day 13, and then 26, then 14, then 29. How many fish did he catch altogether?

**6.** Lester, one day, rode his motorcycle 14 miles, another day 16 miles, another day 12 miles, and another day 18 miles. How many miles did that make?

**7.** Bertha's Uncle had 4 farms. In one there were 80 acres, in another 60 acres, another 40 acres, and the other 160 acres. How many acres did he have?

**8.** Perry's father sold for one man 78 head of sheep, for another 222 head, for another 165 head, and for another 235. How many sheep did he sell altogether?

**9.** A farmer, at one time, marketed 63 bushels of wheat. At another time 57 bushels, and at another time 110 bushels. How many bushels did he market?

**10.** The Homer baseball team played 7 practice games one week, 6 another week, 8 another week, 9 another week and 11 another. How many practice games did it play?

### ADDITION WITH U. S. MONEY.

Noon lunches are provided in many schools. In some schools the children can get a meal for from five to ten cents. The prices in high school lunch rooms are higher than in the grades. Here is a high school lunch "Bill of Fare."

| | | | |
|---|---|---|---|
| Soup (cream of corn, celery or tomato with crackers) | $0.04 | Buns or rolls with butter | .02 |
| Meat Pie | .05 | Sandwiches | .03 |
| Irish Stew with dumplings | .09 | Pickles or Olives | .01 |
| Meat stew with rice | .06 | Celery, stalk | .01 |
| Meat Loaf with potatoes | .07 | Salad | .05 |
| Escalloped corn or Potatoes | .04 | Bananas, each | .02 |
| Baked beans | .03 | Sliced Oranges | .04 |
| Bread and butter | .01 | Charlotte Russe | .05 |
| | | Doughnuts or cookies | .01 |
| | | Rice Pudding | .04 |
| | | Ice Cream and cake | .05 |
| | | Milk or cocoa | .03 |

1. Without pencil, choose a 10¢ lunch.
2. Plan another lunch which you could buy for 9¢.
3. What could you get for 12¢?
4. Write out several lunches which would cost 15¢ or less.
5. What would the following meals for one day cost at the prices given on the following page?

| Breakfast | Lunch | Dinner |
|---|---|---|
| Baked apple with cream | Lettuce and Egg salad | Soup |
| 2 poached eggs | 2 rolls and butter | Steak |
| Buttered Toast | Ice Cream and cake | Creamed celery |
| Coffee | | Pie |
| | | Coffee |

Further explanation of school lunches will add interest. This work and that on the next page is to motivate further work in addition Show that the cent point and dollar sign make no difference in the addition.

### WORK IN U. S. MONEY

People who live away from home in the large cities have to pay more for their meals. In the following bill of fare, the prices, you will see, are higher than at the school lunch rooms.

**A Restaurant Bill of Fare (or Menu)**

| | | | |
|---|---|---|---|
| Soup | $0.10 | Baked apples with cream | $0.10 |
| Roast Beef | .35 | Waffles with Syrup | .15 |
| Turkey with cranberry sauce | .30 | Buttered Toast | .05 |
| Small Steak | .25 | Hot Beef Sandwich | .10 |
| Liver and Bacon | .25 | Ham Sandwich | .10 |
| Ham and eggs | .25 | Egg Sandwich | .10 |
| 2 Eggs, any style | .15 | Cheese Sandwich | .10 |
| Vegetables (side dish) | .10 | Lettuce and Egg Salad | .15 |
| Hot cakes with syrup | .10 | Rolls, each | .02 |
| Hot cakes with sausage | .20 | Butter, extra serving | .01 |
| Wieners with potato salad | .20 | Pie, per cut | .05 |
| Potatoes, Baked or Fried | .10 | Cake, per slice | .05 |
| Baked Beans | .10 | Ice Cream | .10 |
| Baked Apples | .05 | Milk, Cocoa or Coffee | .05 |

Find the cost of the following menus:

**1.**

Turkey with cranberry sauce
Lettuce and egg salad
Pie with ice cream
2 rolls and butter
Coffee

**2.**

Baked apple with cream
Hot cakes with country sausage
Coffee

**3.**

Buttered toast
2 poached eggs
Baked apple
A glass of milk

**4.**

Soup
Small steak
Lettuce Salad
Ice Cream

**5.**

Waffles
Ham and Eggs
Cocoa

Plan and figure the cost of 2 menus.

If she desires, the teacher can base further work on this bill of fare. It would, however, be more interesting and more profitable for the class to make another bill of fare using local data for problems.

## THE SCHOOL STORE

Can you make a school store like this in which to buy and sell real things? Write a list of articles you intend to have in stock, such as potatoes, flour, sugar, tea, etc.

Ask at home for things to sell in your store, such as empty cocoa tins, catsup and olive bottles, egg-boxes, tins which have held canned goods (if they are clean and have been carefully opened), pint and quart milk bottles, empty spice boxes, salt and flour sacks, bushel baskets and the like.

You might even be able to bring some real things such as apples, potatoes, onions, etc. Find out the price of whatever you bring and how it is sold. If potatoes, get the price per peck and by the bushel; if sugar, the cost per pound; if eggs or bananas, the price per dozen.

You can get these prices from the market lists in the papers or your class can send a committee to the grocery store.

It will be well also to list the price of some things you may not be able to have in your store, such as head lettuce and other vegetables, different fruits, nuts, etc.

Perhaps you can obtain some scales and sugar and coffee scoops, paper bags of different sizes, a ball of string. Sawdust, sand and water are easily obtained. Water whitened with chalk dust may be milk.

An oral development of this idea is preferable to letting the children simply read these suggestions. Let them work out the essentials of the plan, then compare with the text.

The careful housewife makes out a list before she orders her groceries. She either knows or asks the price of each commodity before she buys it. In this way she knows just how much she is spending. Here is an example of such a list:

| | |
|---|---|
| 1 doz. oranges | $0.35 |
| 1 lb. butter | .42 |
| 1 tin cocoa | .25 |
| 25 lb. sack flour | 1.25 |
| 1 package yeast | .02 |
| ½ lb. cream cheese | .14 |
| | $2.43 |

The grocer writes the order on a slip for that purpose. Try to get some blocks of new order slips. Or bring some of the used ones you may have at home and rule paper like them.

When you use your store, let the customers make their market lists, have the clerks make out the order slips, and all of you can figure on the bills. You can get toy money or make some substitute to use in making change. Do this just as it is done in all stores. (See note p. 164.)

In keeping store you will find out these things:

5 cents = 1 nickel or ½ dime.
10 cents = 1 dime.
25 cents = ¼ dollar or "quarter"
50 cents = ½ dollar.
100 cents = 1 dollar.
2 nickels = 1 dime.
5 dimes = ½ dollar.
Two ½ dollars = 1 dollar.
5 nickels = ¼ dollar.
4 "quarters" = 1 dollar.

2 pints = 1 quart.
4 quarts = 1 gallon.
8 quarts = 1 peck.
4 pecks = 1 bushel.

12 things = 1 dozen.
6 things = ½ dozen.
4 things = ¼ dozen.
3 things = ⅓ dozen.

16 oz. = 1 lb.
8 oz. = ½ lb.
4 oz. = ¼ lb.
2 oz. = ⅛ lb.

### REVIEW PRACTICE PROBLEMS IN ADDITION

| **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|
| 574 | 735 | 187 | 879 | 854 | 850 |
| 456 | 985 | 657 | 824 | 776 | 678 |
| 282 | 534 | 654 | 585 | 863 | 547 |
| 223 | 373 | 409 | 644 | 587 | 945 |
| 105 | 233 | 361 | 235 | 495 | 286 |

**7.—12.** Add columns a to f.

**13.—18.** Write lines g to l in columns and add.

| | a. | b. | c. | d. | e. | f. |
|---|---|---|---|---|---|---|
| g. | 265 | 774 | 83 | 319 | 172 | 467 |
| h. | 154 | 562 | 474 | 255 | 327 | 383 |
| i. | 436 | 423 | 32 | 134 | 635 | 234 |
| j. | 243 | 353 | 545 | 623 | 264 | 682 |
| k. | 342 | 631 | 261 | 756 | 400 | 155 |
| l. | 267 | 775 | 486 | 430 | 579 | 667 |

**19.** Try to make an addition problem in which you could group the figures into 9's, 10's, or 8's.

| **20.** | **21.** | **22.** | **23.** | **24.** | **25.** |
|---|---|---|---|---|---|
| 9324 | 3179 | 5464 | 6241 | 8324 | 6254 |
| 2562 | 4856 | 3621 | 4375 | 1506 | 8217 |
| 4989 | 5123 | 4879 | 8690 | 7462 | 9364 |

### Examinations in Addition

Before advancing to the next subject, let the class and the teacher, working together, prepare an examination, in the form of test problems, covering the work given on pages 47 to 75. This will prove a valuable exercise in stimulating the pupil to *an interested investigation of his own work*, and these test problems will also serve as an important basis for subsequent reviews. See "Teaching Suggestions," p. 277.

# SUBTRACTION

You have already learned the principal subtraction facts When written in order, these facts make a subtraction table such as this:

1 − 1 = 0

2 − 1 = 1
3 − 1 = 2
4 − 1 = 3
5 − 1 = 4
6 − 1 = 5

7 − 1 = 6
8 − 1 = 7
9 − 1 = 8
10 − 1 = 9
11 − 1 = 10

Write the answers to this subtraction table of the **2's.**

2 − 2 =

3 − 2 =
4 − 2 =
5 − 2 =
6 − 2 =
7 − 2 =

8 − 2 =
9 − 2 =
10 − 2 =
11 − 2 =
12 − 2 =

### Problems for Oral Solution

**1.** How old were you two years ago?

**2.** A dime, less 2 cents, are how many cents?

**3.** If you have a nickel and 4 cents, and lose 2 cents, how much money have you left?

**4.** Robert's Uncle gave him 6 pennies on his birthday. He spent 2 of them. How many had he left?

**5.** If you buy 8 cents worth of postage stamps, and pay for them with a dime, what change do you receive?

**6.** Bertha's mother gave her 3 pieces of ribbon for her doll. She used 2 of them. How many had she left?

### SUBTRACTION WITH THE TWOS

7. Of 9 cents that Bennie lost on his way home from the Post Office, 7 were found again. How many were not found?

8. A man had 8 apple trees, and 4 pear trees, and 2 of his trees were killed by frost. How many has he left?

9. There are 9 members of a picnic committee in a certain school. If 2 members of the committee should be absent, how many would be left?

### Written Practice with the 2's

Copy this subtraction table of the 2's in the vertical form and under each line in your copy write the difference.

$$\begin{array}{rrrrrr} 2 & 3 & 4 & 5 & 6 & 7 \\ \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} \end{array}$$

$$\begin{array}{rrrrr} 8 & 9 & 10 & 11 & 12 \\ \underline{2} & \underline{2} & \underline{\ \ 2} & \underline{\ \ 2} & \underline{\ \ 2} \end{array}$$

Find the missing numbers in this subtraction table:

$$\begin{array}{cccccccc} 2 & ? & ? & ? & ? & ? & ? & ? \\ \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} \\ ? & 3 & 2 & 5 & 4 & 7 & 6 & 8 \end{array}$$

Make a problem in subtraction in which you use the number 2.

$$\begin{array}{lll} 6 - ? = 4 & 7 - ? = 5 & 9 - ? = 7 \\ 8 - ? = 6 & 4 - ? = 2 & 5 - ? = 3 \end{array}$$

The "Austrian Method" (see explanatory note p. 164) may be preferred by some teachers in oral work in subtraction. By a slight transposition it will apply to most of these lessons, as "2 and what are 5?", "2 and what are 8?". The children will quickly see that this method is simply inverse addition.

Fill in the missing numbers in the table of 3's.

4 − 3 =
5 − 3 =
? − 3 =
? − 3 =
? − 3 =
9 − 3 =
? − 3 =
? − 3 =
? − 3 =
? − 3 =

Write this table so that the answer, each time is 3.

4 − 1 = 3
? − 2 = 3
? − 3 = 3
? − 4 = 3
? − 5 = 3
9 − 6 = 3
? − 7 = 3
? − 8 = 3
? − 9 = 3
? − 10 = 3

### Problems for Oral Solution

**1.** There are 12 inches in one foot. 3 inches from one foot leaves how many inches?

**2.** In one year there are 12 months. If a student is absent from home 9 months in the year, how long is he at home?

**3.** A quarter equals 5 nickels. If you have 8 nickels, and buy a quarter's worth of stationery, how many nickels have you left?

The terms "minuend," "subtrahend," "minus," "difference," etc., are to be introduced *as need for their use arises.* The children often adopt such terms from hearing them spoken of, becoming in a measure familiar with them before it is necessary to explain their exact meaning. The children's experience then enables them to formulate a simple definition of their own, such as: "The minuend is the larger number," to which the teacher might add, "And the word *minuend* means something to be *diminished* or made less." Similarly the children may define the "subtrahend" as the "smaller number," the teacher supplementing with "*Subtrahend* means something to be *subtracted* or taken away."

### SUBTRACTION WITH THE THREES

**4.** If a pair of shoes costs $3.00, and you pay for them with a ten-dollar bill, how much money will you receive in change?

**5.** If a merchant sells $7.00 worth of goods, and receives in payment a ten-dollar bill, how much must he give back in change?

**6.** There are 8 quarts in a peck. If a man lacks 3 quarts of having a peck of beans, how many quarts has he?

**7.** If the train leaves at noon, and a traveler is ready to leave at 9 o'clock in the morning, how long will he have to wait?

### Written Practice with the 3's

Copy this table of the 3's and write the differences.

| | | | | | |
|---|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 | 8 |
| 3 | 3 | 3 | 3 | 3 | 3 |

| | | | | |
|---|---|---|---|---|
| 9 | 10 | 11 | 12 | 13 |
| 3 | 3 | 3 | 3 | 3 |

Find the missing numbers in this table:

| | | | | |
|---|---|---|---|---|
| ? | ? | ? | ? | ? |
| 5 | 1 | 6 | 3 | 8 |
| 3 | 3 | 3 | 3 | 3 |
| ? | ? | ? | ? | ? |
| 2 | 7 | 9 | 4 | 10 |
| 3 | 3 | 3 | 3 | 3 |

Write a subtraction problem using the number 3.

Complete this subtraction table of 4's.

$$4 - 4 = ?$$

$$\begin{array}{lcl} 5 - 4 = ? & \qquad & 10 - ? = 4 \\ 6 - 4 = ? & & ? - ? = ? \\ ? - 4 = ? & & ? - ? = ? \\ ? - ? = ? & & ? - ? = ? \\ ? - ? = ? & & ? - ? = ? \end{array}$$

**The term "difference" may be introduced and explained here.**

### Written Practice with the 4's

Copy this table of the 4's and write the differences.

$$\begin{array}{rrrrrr} 4 & 5 & 6 & 7 & 8 & 9 \\ \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} \end{array}$$

$$\begin{array}{rrrrr} 10 & 11 & 12 & 13 & 14 \\ \underline{\ \ 4} & \underline{\ \ 4} & \underline{\ \ 4} & \underline{\ \ 4} & \underline{\ \ 4} \end{array}$$

Find the missing numbers:

$$\begin{array}{rrrrr} 5 & 9 & 12 & 7 & 13 \\ \underline{?} & \underline{?} & \underline{\ \ ?} & \underline{?} & \underline{\ \ ?} \\ 4 & 4 & 4 & 4 & 4 \end{array}$$

$$\begin{array}{rrrrr} 8 & 14 & 11 & 6 & 10 \\ \underline{?} & \underline{\ \ ?} & \underline{\ \ ?} & \underline{?} & \underline{\ \ ?} \\ 4 & 4 & 4 & 4 & 4 \end{array}$$

**The term "subtrahend" may be introduced and explained here.**

Write a subtraction problem using the number 4.

### Test Problems

$10 - ? = 5$ $\quad 14 - ? = 9$ $\quad 13 - ? = 8$

$15 - ? = 10$ $\quad 12 - ? = 7$ $\quad 11 - ? = 5$

## SUBTRACTION WITH THE FIVES

Build the subtraction table of 5's as the table of 1's, 2's, 3's and 4's have been built.

$$\begin{array}{lcl} 6 - 5 = ? & \qquad & 11 - 5 = ? \\ ? - ? = ? & & ? - ? = ? \\ ? - ? = ? & & ? - ? = ? \\ ? - ? = ? & & ? - ? = ? \\ ? - ? = ? & & ? - ? = ? \end{array}$$

### Problems for Oral Solution

1. A dime less a nickel is how much money?

2. Nine boys less 5 boys are how many boys?

3. Twelve cents less 5 cents are how many cents?

4. A newsboy had 14 papers and sold 5. How many had he left?

5. Of 11 men in an office, 5 have their lives insured. How many of them are without life insurance?

### Written Practice with the 5's

Copy this table of the 5's, and write the differences.

$$\begin{array}{ccccccccc} 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 \\ \underline{5} & \underline{5} & \underline{5} & \underline{\phantom{1}5} & \underline{\phantom{1}5} & \underline{\phantom{1}5} & \underline{\phantom{1}5} & \underline{\phantom{1}5} & \underline{\phantom{1}5} \end{array}$$

Find the missing numbers:

$$\begin{array}{ccccccccc} ? & ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{5} & \underline{\phantom{1}5} \\ 4 & 3 & 6 & 5 & 2 & 7 & 9 & 8 & 10 \end{array}$$

The term "minuend" may be introduced and explained here.

Build the subtraction table of the 6's as previously shown.

### Problems for Oral Solution

1. Ten girls less 6 girls are how many girls?

2. After 6 months of the year have passed, how many months remain?

3. If you take 2 quarts from a peck of shelled corn, how many quarts will be left?

4. Of 15 gas jets in a dwelling, 6 had mantles. How many were without mantles?

5. A man bought 9 tons of coal, then 3 more, and used 6 tons. How many tons had he left?

6. The flag has 13 stripes of white and of red, and 6 of them are white. How many of them are red?

7. Johnnie Careless went to market with one dozen eggs. On the way to market 6 eggs were broken. How many unbroken eggs had Johnnie to sell?

### Written Practice with the 6's

Copy this table of the 6's, and write the differences.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

Find the missing numbers:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 4 | 6 | 9 | 5 | 2 | 3 | 7 | 10 | 8 |

### Test Problems

$12 - ? = 5$ $17 - ? = 10$ $16 - ? = 9$

## SUBTRACTION WITH THE SEVENS

Write the subtraction table of 7's as previously shown.

Fill in the missing numbers in this table:

8 − 1 = 7
? − 2 = 7
? − 3 = 7
? − 4 = 7
? − 5 = 7

13 − 6 = 7
? − 7 = 7
? − 8 = 7
? − 9 = 7
? − 10 = 7

In each of the above problems find the sum of the two given numbers. How does the sum compare with the missing number?

### Written Practice with the 7's

Copy this table of the 7's.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

Prove your work by addition.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 10 | 5 | 4 | 3 | 7 | 2 | 6 | 8 | 9 |

Invent a problem showing the subtraction of 7 from some other number in the above tables.

Find the difference:

17 − 10 = ?
12 − 7 = ?
**15 − 8 = ?**

Find the subtrahend:

10 − ? = 3
13 − ? = 7
14 − ? = 7

Find the minuend:

? − 10 = 7
? − 6 = 7
? − 7 = 9
? − 7 = 7
? − 4 = 7
? − 8 = 7

Build the subtraction table of 8's as shown.

What is an easy way to find the missing terms in the following table?

$9 - 1 = 8$
$? - 2 = 8$
$? - 3 = 8$
$? - 4 = 8$
$? - 5 = 8$

$14 - 6 = 8$
$? - 7 = 8$
$? - 8 = 8$
$? - 9 = 8$
$? - 10 = 8$

### Problems for Oral Practice

**1.** Fifteen less 7 are how many?

**2.** Eleven dimes less 3 dimes are how many dimes?

**3.** After 8 months of the year have passed, how many months remain?

**4.** Robert is 10 years old and his brother is 18 years old. What is the difference in their ages?

**5.** Roy had 11 dollars in the postal savings bank, and drew out 3 dollars. How much had he left on deposit?

### Written Practice with the 8's

Copy this table of the 8's and give the differences.

$$\begin{array}{ccccccccc} 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 \\ \underline{8} & \underline{8} & \underline{8} & \underline{8} & \underline{8} & \underline{8} & \underline{8} & \underline{8} & \underline{8} \end{array}$$

How can you find the missing terms in the following?

$$\begin{array}{ccccccccc} ? & ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{2} & \underline{3} & \underline{4} & \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \\ 8 & 8 & 8 & 8 & 8 & 8 & 8 & 8 & 8 \end{array}$$

$? - 8 = 7$ $\quad ? - 8 = 10$ $\quad ? - 8 = 6$

### SUBTRACTION WITH THE NINES AND TENS

Build the subtraction table of the 9's as you have been shown.

Make a table of the missing numbers, such as was given with the 8's and 7's.

Fill in the missing terms in your tables.

Make similar tables for the 10's and complete your tables by supplying the missing numbers.

Write this table of the 9's and give the differences:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

Write this table of the 10's and give the differences:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

Point out in the above tables the Minuend, the Subtrahend and the Difference.

How can you show that your answers are correct?

### REVIEW

Give orally the following differences:

16 – 6
15 – 5
14 – 10
13 – 3
16 – 8
12 – 2
13 – 7
12 – 3
11 – 5
12 – 4
13 – 10

15 – 6
16 – 7
14 – 8
13 – 4
13 – 6
16 – 9
14 – 9
12 – 5
13 – 9
12 – 6
11 – 7

14 – 6
15 – 7
16 – 10
14 – 4
15 – 9
13 – 5
11 – 3
12 – 7
11 – 5
12 – 10
11 – 4

14 – 5
12 – 8
15 – 8
12 – 9
11 – 6
15 – 10
11 – 8
13 – 8
11 – 6
14 – 7
11 – 9

**1.** In a certain country school there is a noon recess of 45 minutes. The children use 20 minutes in eating their lunches. How many minutes are left for play?

$$\begin{array}{r} 45 \\ \underline{20} \end{array}$$

**2.** There are 28 children altogether in this school, 6 are in first grade. When the first grade children are out on the playground, how many children are left in the room?

$$\begin{array}{r} 28 \\ \underline{6} \end{array}$$

**3.** Twelve of these 28 children live on one crossroad, and call for one another each morning. How many come from other roads?

**4.** One day there was such deep snow that only 14 of the older children could get to school. How many were absent that day?

Find the following differences:

| **5.** | **6.** | **7.** | **8.** | **9.** | **10.** | **11.** | **12.** |
|---|---|---|---|---|---|---|---|
| 60 | 47 | 98 | 17 | 29 | 74 | 99 | 82 |
| 30 | 17 | 54 | 10 | 8 | 63 | 88 | 51 |
| **13.** | **14.** | **15.** | **16.** | **17.** | **18.** | **19.** | **20.** |
| 48 | 72 | 38 | 96 | 89 | 67 | 96 | 82 |
| 23 | 41 | 26 | 54 | 37 | 23 | 84 | 40 |
| **21.** | **22.** | **23.** | **24.** | **25.** | **26.** | **27.** | **28.** |
| 44 | 52 | 68 | 26 | 49 | 58 | 92 | 86 |
| 22 | 11 | 54 | 12 | 37 | 16 | 80 | 43 |

What is the minuend in a subtraction problem?

What is the subtrahend?

What is the remainder or difference?

## WRITTEN SUBTRACTION

### I

**1.** In a city school, 2 rooms of the same grade use together a set of 40 readers. When 1 room is using 25 of the books, how many are left on the shelf?[1]

$$\begin{array}{r}40\\ \underline{25}\end{array}$$

Work the following problems in subtraction:

| **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** | **9.** |
|---|---|---|---|---|---|---|---|
| 35 | 50 | 38 | 76 | 60 | 30 | 40 | 64 |
| 17 | 26 | 29 | 47 | 38 | 18 | 27 | 35 |

| **10.** | **11.** | **12.** | **13.** | **14.** | **15.** | **16.** | **17.** |
|---|---|---|---|---|---|---|---|
| 42 | 71 | 65 | 84 | 72 | 32 | 55 | 92 |
| 23 | 52 | 36 | 65 | 48 | 28 | 37 | 63 |

| **18.** | **19.** | **20.** | **21.** | **22.** | **23.** |
|---|---|---|---|---|---|
| 382 | 436 | 562 | 641 | 864 | 754 |
| 163 | 217 | 235 | 324 | 525 | 329 |

---

[1] The solving of this problem involves the first case of "borrowing" in subtraction. When the children discover they cannot take 5 from 0, the development may be as follows:

"We cannot subtract 5 from 0 in the unit's column, but we have not used all of the "minuend." We can take 1 ten from the ten's column. 1 ten = 10 units. We now have:

$$\begin{array}{ll} 40= & \text{3 tens and 10 units}\\ \underline{25=} & \underline{\text{2 tens and 5 units}}\\ 15= & \text{1 ten and 5 units}\\ & \text{1 ten and 5 units} = 15.\end{array}$$

We need not write out this separation. We can *think* it by calling the 0 ten, and calling the 4 three." Drill thoroughly on the practice problems given until the process is fully understood. Additional drill for this type of problems is found on p. 92, 1.

**24.** Robert is setting out 36 cabbage plants for his father. When he has transplanted 17, how many has he yet to do?

$$\begin{array}{r}36\\ \underline{17}\end{array}$$

**25.** There were 34 days left before summer vacation. When 15 more days had passed how many days more were there yet before school closed?

$$\begin{array}{r}34\\ \underline{15}\end{array}$$

**26.** There were 42 pieces of chalk in the box. At the beginning of the week Marjorie took out 14 pieces to put in the chalk trays. How many pieces were left in the box?

$$\begin{array}{r}42\\ \underline{14}\end{array}$$

Can you make and work a problem like one of the above using the number of days until Christmas, Thanksgiving or Spring Vacation?

Perform the following subtractions, and then see if you can write a problem of your own, using any two of these numbers:

| **27.** | **28.** | **29.** | **30.** | **31.** | **32.** | **33.** | **34.** | **35.** | **36.** |
|---|---|---|---|---|---|---|---|---|---|
| 71 | 54 | 28 | 63 | 76 | 50 | 55 | 32 | 69 | 43 |
| 28 | 29 | 18 | 18 | 49 | 39 | 48 | 19 | 58 | 29 |

## II

**1.** A certain school had 605 pupils. In February it sent 24 to the High School. There was no entering first grade class. How many pupils were then in the school?[1]

$$\begin{array}{r}605\\ \underline{24}\\ 581\end{array}$$

---

[1] This problem is to introduce the 2nd type of problems in subtraction, taking from the hundreds when there is a 0 in the ten's column of the minuend. Develop as in problem 1, page 88.

## WRITTEN SUBTRACTION

Work the following problems. Prove each one.

| 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|
| 305 | 408 | 707 | 608 | 204 | 107 |
| 35 | 71 | 63 | 45 | 21 | 96 |

Additional drill for this type is found on p. 92, II.

### III

1. There are 365 days in a year. Many schools have a school year of 195 days. How many days in the year are left for Saturdays and Sundays, holidays and vacations?[1]

365
195

2. In a number of schools the school year consists of only 182 days. How many days in the year are left for holidays, vacations, Saturdays and Sundays?

365
182

3. Many country schools are in session only 160 days in a year. During how many days in the year is there no school?

365
160

Prove your subtraction in the following problems:

| 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|
| 234 | 427 | 509 | 458 | 304 | 675 |
| 83 | 145 | 364 | 276 | 173 | 492 |

---

[1] This problem is to introduce type 3 in subtraction: taking from the hundreds when the figure in the ten's column of the minuend is other than 0. Additional drill for this case is found on p. 92, III.

## IV

1. In a spelling test of 20 words, Janet had 15 subtracted from the perfect mark of 100, because she misspelled 3 words. What was the grade on her paper?[1]

$$\begin{array}{r} 100 \\ \underline{15} \end{array}$$

2. In a test of 25 words, each misspelled word counts off 4. Henry missed 2 words. What was taken from his grade? What was his mark?

3. Andrew, who is a very poor speller, had 44 subtracted from his grade. Find his standing.

Perform these subtractions:

| 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|
| 100 | 100 | 200 | 300 | 200 | 400 |
| 26 | 72 | 48 | 27 | 56 | 72 |

---

[1] This introduces the fourth type of problems in subtraction, in which it is necessary to take from the hundreds to supply the lack in units.

"We cannot subtract 5 units from 0 units. Since there are no tens in the next column, we cannot take 1 ten as before. But we have 10 tens in the 1 one hundred. We can think of the 10 tens as being in ten's column.

100 = 10 tens and 0 units
15 = 1 ten and 5 units

Now take one of the 10's and writing it as 10 units we have:

100 = 9 tens and 10 units
15 = 1 ten and 5 units
85 = 8 tens and 5 units or 85."

Give practice with above problems in thinking these separations. Additional drill for this type is found on page 92.

Repeat with as many more problems as seem necessary to make the process clear.

## DRILL PROBLEMS IN WRITTEN SUBTRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| I. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
| | 40 | 70 | 30 | 90 | 80 | 60 | 90 | 80 |
| | 28 | 42 | 26 | 53 | 34 | 27 | 82 | 45 |
| | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
| | 40 | 50 | 60 | 30 | 690 | 440 | 250 | 790 |
| | 24 | 12 | 48 | 16 | 59 | 27 | 36 | 85 |
| II. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
| | 306 | 206 | 804 | 405 | 603 | 505 | 707 | 505 |
| | 283 | 135 | 542 | 251 | 423 | 364 | 276 | 213 |
| | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
| | 804 | 209 | 608 | 907 | 408 | 804 | 601 | 908 |
| | 641 | 177 | 26 | 35 | 62 | 54 | 385 | 735 |
| III. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
| | 288 | 963 | 627 | 252 | 747 | 639 | 565 | 377 |
| | 191 | 673 | 542 | 162 | 595 | 456 | 193 | 193 |
| | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
| | 968 | 857 | 739 | 748 | 845 | 627 | 715 | 937 |
| | 87 | 82 | 73 | 95 | 62 | 54 | 231 | 482 |
| IV. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
| | 300 | 500 | 200 | 600 | 800 | 700 | 900 | 400 |
| | 74 | 83 | 35 | 64 | 392 | 478 | 589 | 328 |

### Examinations in Subtraction

Before advancing to the next subject, let the class and the teacher, working together, prepare an examination, in the form of test problems, covering the work given on pages 77 to 91. See Suggestions, p. 277.

# MULTIPLICATION

## MULTIPLICATION WITH THE TWOS

You have already had the table of multiplication by two. In this review table, write the products.

1 × 2 =
2 × 2 =
3 × 2 =
4 × 2 =
5 × 2 =
6 × 2 =
7 × 2 =
8 × 2 =
9 × 2 =
10 × 2 =

Recite the table like this: "Once 2 is 2, two 2's are 4, three 2's are 6, four 2's are 8, etc.

### Problems for Oral Solution

1. How many days are there in 2 weeks?

2. How many gloves are there in 4 pairs?

3. How many cents are there in 2 nickels?

4. A hexagon is a figure of 6 sides, as in the cell of a honeycomb. How many sides are there in 2 hexagons?

5. How many players are there in 2 baseball teams of 9 members each?

### Written Practice with the Multiplication of the 2's

Here is the table in vertical form. Give the products.

$$\begin{array}{cccccccccc} 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\ \underline{1} & \underline{2} & \underline{3} & \underline{4} & \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

**This page is for review only. If the children have not already learned the 2's, go back and develop as suggested on page 44. Let them make and solve other concrete problems using the tables on this page.**

## MULTIPLICATION WITH THE THREES

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Find by adding:

Three 1's = ?
Three 2's = ?
Three 3's = ?
Three 4's = ?
Three 5's = ?
Three 6's = ?
Three 7's = ?
Three 8's = ?
Three 9's = ?
Three 10's = ?

Find by adding:

3 × 1 =
3 × 2 =
3 × 3 =
3 × 4 =
3 × 5 =
3 × 6 =
3 × 7 =
3 × 8 =
3 × 9 =
3 × 10 =

### Problems for Oral Practice

**1.** How many days are there in 3 weeks?

**2.** How many horseshoes are required to shoe 3 horses?

**3.** Nine houses have 3 chimneys each. How many chimneys are there?

**4.** If we count 5 members to a family, how many members are there in 3 families?

**5.** A student works 10 months in a year. How many months does he work in three years?

**6.** A triangle is a figure of 3 sides. How many sides are there in 2 triangles?

7. Six chandeliers have 3 electric light bulbs apiece. How many bulbs are there in all?

8. A clerk saves $3.00 a week from his salary. How much will he save in 8 weeks?

9. The hard pine of Georgia has 3 needles in a bunch. How many needles are there in 5 bunches?

10. The soft white pine of the North has 5 needles in a bunch. How many are there in 3 bunches?

### Written Practice with the 3's

Copy this vertical table of the 3's and write the product below the line under each column.

$$\begin{array}{cccccccc} 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} \end{array}$$

Write this table in the reverse order and give the products:

$$\begin{array}{ccccccc} 3 & 3 & 3 & 3 & 3 & 3 & 3 \\ \underline{4} & \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Find the missing numbers in this multiplication table:

$$\begin{array}{cccccccc} ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} & \underline{3} \\ 15 & 12 & 9 & 18 & 24 & 30 & 27 & 21 \end{array}$$

**On the preceding page is indicated, in concentrated form the material for a number of lessons. Do not try to do it all in two or three days. Use together the corresponding parts of the first 3 tables. Follow plan of review and drill worked out in second grade addition and subtraction.**

**Emphasize abstract rather than concrete drill on these facts.**

**The oral problems are chiefly to help children in making original ones of their own in which to apply each new number fact as it is learned.**

## MULTIPLICATION WITH THE FOURS

Make an addition table for the 4's, as the table for the 3's was made, by writing in columns each number **four** times.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |

Find the products in the following table by addition as shown above:

Four 1's are ?
Four 2's are ?
Four 3's are ?
Four 4's are ?
Four 5's are ?

Four 6's are ?
Four 7's are ?
Four 8's are ?
Four 9's are ?
Four 10's are ?

Copy and complete this table:

4 × 1 =
4 × 2 =
4 × 3 =
4 × 4 =

4 × 5 =
4 × 6 =

4 × 7 =
4 × 8 =
4 × 9 =
4 × 10 =

### Problems for Oral Practice

**1.** How many cents in 4 dimes?

**2.** How many cents in 4 nickels?

**3.** How many quarts in 4 gallons?

**4.** There are 4 pecks in a bushel. How many pecks are there in 9 bushels?

**5.** The term of the President is 4 years. How many years are there in 6 terms?

6. If a castle has 4 towers, and each tower has 8 windows, how many windows have they all?

7. There are 8 squares in a row on a checkerboard. How many squares are there in 4 rows?

8. Six feet make a fathom. How many feet are there in 4 fathoms?

9. If a man earns $4.00 a working day, how much does he earn in a week?

10. There are 7 golf clubs in a set. How many golf clubs are there in 4 sets?

### Written Practice with the 4's

Copy this table of the 4's and write the product under each column.

$$\begin{array}{ccccccc} 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{4} & \underline{\phantom{1}4} \end{array}$$

Copy in the reverse order and write the product.

$$\begin{array}{cccccc} 4 & 4 & 4 & 4 & 4 & 4 \\ \underline{5} & \underline{6} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Write a problem using 4 and 4.

Write a problem using 4 and 6.

Find the missing numbers in this multiplication table:

$$\begin{array}{cccccccc} ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{\phantom{2}4} & \underline{\phantom{1}4} & \underline{\phantom{2}4} & \underline{\phantom{1}4} & \underline{\phantom{3}4} & \underline{\phantom{2}4} & \underline{\phantom{3}4} & \underline{\phantom{4}4} \\ 24 & 16 & 20 & 12 & 32 & 28 & 36 & 40 \end{array}$$

$4 \times 9 = ?$ $? \times 4 = 28$ $8 \times ? = 32$

### MULTIPLICATION WITH THE FIVES

Make an addition table for the 5's, as the table for the 4's was made, by writing in columns each number **five** times.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |

Find the products in the following table by addition as shown above:

Five 1's are ?
Five 2's are ?
Five 3's are ?
Five 4's are ?
Five 5's are ?
Five 6's are ?
Five 7's are ?
Five 8's are ?
Five 9's are ?
Five 10's are ?

Copy and complete this table:

$5 \times 1 =$
$5 \times 2 =$
$5 \times 3 =$
$5 \times 4 =$
$5 \times 5 =$
$5 \times 6 =$
$5 \times 7 =$
$5 \times 8 =$
$5 \times 9 =$
$5 \times 10 =$

### Problems for Oral Practice

**1.** How many cents in 5 dimes?

**2.** How many cents in 5 nickels?

**3.** How many wheels on 5 wagons?

**4.** If a pair of shoe strings costs a nickel, how many cents will 6 pairs cost?

**5.** How many members are needed for 5 baseball teams of 9 members each?

**6.** If a tile walk is 5 tiles wide, and 7 tiles long, how many tiles does it have?

**7.** If a motor boat has a speed of 10 miles an hour how far will it go in 5 hours?

**8.** A starfish has 5 points, called "fingers." How many such fingers do 5 star fish have?

**9.** If there are 6 autobuses, each carrying 5 passengers. How many passengers are carried?

**10.** Mr. Mason paid 10 dollars for 1 set of golf clubs. At that price, what would 5 sets cost?

**11.** John walks 8 blocks a day going and coming from school. How many blocks does he walk in 5 days?

### Written Practice with the 5's

Copy the table of the 5's and write the product under each column.

$$\begin{array}{cccccc} 5 & 6 & 7 & 8 & 9 & 10 \\ \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} \end{array}$$

Copy in the reverse order and write the product.

$$\begin{array}{ccccc} 5 & 5 & 5 & 5 & 5 \\ \underline{\;6\;} & \underline{\;7\;} & \underline{\;8\;} & \underline{\;9\;} & \underline{10} \end{array}$$

Write one problem using 5 and 5, and another. problem using 5 and 10.

Find the missing numbers in this multiplication table:

$$\begin{array}{cccccccc} ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} & \underline{\;5\;} \\ 30 & 15 & 35 & 20 & 25 & 45 & 40 & 50 \end{array}$$

## MULTIPLICATION WITH THE SIXES

Make an addition table for the 6's, as the table for the 5's was made, by writing in columns each number **six** times.

Find the products in the following table, by addition, as previously shown:

Six 1's are ?
Six 2's are ?
Six 3's are ?
Six 4's are ?
Six 5's are ?
Six 6's are ?
Six 7's are ?
Six 8's are ?
Six 9's are ?
Six 10's are ?

Copy and complete this table:

$6 \times 1 =$
$6 \times 2 =$
$6 \times 3 =$
$6 \times 4 =$
$6 \times 5 =$
$6 \times 6 =$
$6 \times 7 =$
$6 \times 8 =$
$6 \times 9 =$
$6 \times 10 =$

### Problems for Oral Practice

**1.** Six times 10 dimes are how many dimes?

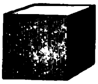
**2.** Ten years make a decade. How many years are there in 6 decades?

**3.** If there are 6 volumes in a set, how many volumes are there in 3 sets?

**4.** The black bass has 7 fins, counting the tail a fin. How many fins do 6 black bass have?

**5.** There are 3 feet in a yard. How many feet are there in six yards?

**6.** Harry helped his uncle Charles pick 4 bushels of golden russet apples from each of 6 trees. How many bushels did they pick in all?



**7.** How deep is a lake which measures 8 fathoms? (See problem 7, p. 97).

**8.** A cube has 6 faces. How many faces do 7 cubes have?

**9.** How much will 6 footballs cost at 2 dollars each?

**10.** If a room is rented for 10 dollars a month, what will be the rent for 6 months?

**11.** The legs and pincers of a lobster are 10 in number. How many do 6 lobsters have?

**12.** If a Northern harbor is closed by ice for 3 months in the year, how many months is it closed in 6 years?

### Written Practice with the 6's

Copy this table of the 6's and write the product under each column.

$$\begin{array}{ccccc} 6 & 7 & 8 & 9 & 10 \\ \underline{6} & \underline{6} & \underline{6} & \underline{6} & \underline{6} \end{array}$$

Copy in the reverse order and write the product under each column.

$$\begin{array}{cccc} 6 & 6 & 6 & 6 \\ \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Write a problem using the number 6 and the number 8.

Write another problem using 6 and 10.

Find the missing numbers in this multiplication table:

$$\begin{array}{cccccccc} ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{6} & \underline{6} & \underline{6} & \underline{6} & \underline{6} & \underline{6} & \underline{6} & \underline{6} \\ 30 & 48 & 24 & 42 & 18 & 36 & 54 & 60 \end{array}$$

## MULTIPLICATION WITH THE SEVENS

Make an addition table for the 7's, as the table for the 6's was made, by writing in columns each number **seven** times.

Find the products in the following table, by addition, as you have been shown:

Seven 1's are ?
Seven 2's are ?
Seven 3's are ?
Seven 4's are ?
Seven 5's are ?
Seven 6's are ?
Seven 7's are ?
Seven 8's are ?
Seven 9's are ?
Seven 10's are ?

Copy and complete this table:

$7 \times 1 =$
$7 \times 2 =$
$7 \times 3 =$
$7 \times 4 =$
$7 \times 5 =$
$7 \times 6 =$
$7 \times 7 =$
$7 \times 8 =$
$7 \times 9 =$
$7 \times 10 =$

### Problems for Oral Practice

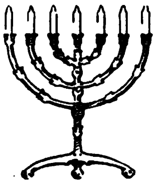
**1.** Seven nickels are equal to how many cents?

**2.** How many days are there in 7 weeks?

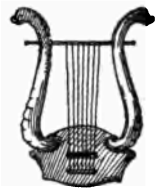
**3.** A building 7 stories high has 4 offices on each floor. How many offices are there in the building?

**4.** There are 4 dozen stars in the flag. How many dozen stars must be made for 7 flags?

**5.** There were 7 candles in the great candlestick of the Jews. How many candles are required to supply five such candlesticks?



**6.** The ancient lyre had 7 strings. How many strings did eight lyres have?



**7.** If 3 children are each 7 years of age, what is the sum of their ages, told by multiplication?

**8.** If 6 dwellings have each 7 rooms, how many rooms are there in all?

**9.** Nine inches make a span. How many inches are there in 7 spans?

**10.** If there are 9 players in a baseball team, how many players would there be in 7 baseball teams?

**11.** If a railway grade rises 7 feet for every mile, how high will it rise in 10 miles?

**12.** The ancient Greeks called a period of 4 years an Olympiad. How many years were there in 7 Olympiads?

### Written Practice with the 7's

Copy this double table of the 7's and write the product under each column.

$$\begin{array}{ccccccc} 7 & 8 & 9 & 10 & 7 & 7 & 7 \\ \underline{7} & \underline{7} & \underline{7} & \underline{7} & \underline{8} & \underline{9} & \underline{10} \end{array}$$

Write two problems in which you use the number 7.

Find the missing numbers in this multiplication table:

$$\begin{array}{cccccccc} ? & ? & ? & ? & ? & ? & ? & ? \\ \underline{7} & \underline{7} & \underline{7} & \underline{7} & \underline{7} & \underline{7} & \underline{7} & \underline{7} \\ 35 & 70 & 28 & 49 & 21 & 56 & 42 & 63 \end{array}$$

## MULTIPLICATION WITH THE EIGHTS

Make an addition table for the 8's, as the table for the 7's was made, by writing in columns each number **eight** times.

Find the products in the following table, by addition, as you have been shown:

Eight 1's are ?
Eight 2's are ?
Eight 3's are ?
Eight 4's are ?
Eight 5's are ?
Eight 6's are ?
Eight 7's are ?
Eight 8's are ?
Eight 9's are ?
Eight 10's are ?

Copy and complete this table:

8 × 1 =
8 × 2 =
8 × 3 =
8 × 4 =
8 × 5 =
8 × 6 =
8 × 7 =
8 × 8 =
8 × 9 =
8 × 10 =

### Problems for Oral Solution

**1.** There are 3 feet in a yard. How many feet are there in 8 yards?

**2.** John made 8 rows of dots, 7 dots in a row. How many dots did he make?

**3.** If a coat of a certain pattern requires 9 buttons, how many buttons will 8 such coats require?

**4.** A checker-board has 8 rows of squares, with 8 squares in each row. How many squares are there in all rows?

**5.** Mr. Mason sent 8 packages by parcel post. On each package he placed 4 two-cent stamps. What did the stamps cost him?

## MULTIPLICATION WITH THE NINES

Make an addition table for the 9's, as the table for the 8's was made, by writing in columns each number **nine** times.

Find the products in the following table, by addition as you have been shown:

Nine 1's are ?
Nine 2's are ?
Nine 3's are ?
Nine 4's are ?
Nine 5's are ?
Nine 6's are ?
Nine 7's are ?
Nine 8's are ?
Nine 9's are ?
Nine 10's are ?

Copy and complete this table:

$9 \times 1 =$
$9 \times 2 =$
$9 \times 3 =$
$9 \times 4 =$
$9 \times 5 =$
$9 \times 6 =$
$9 \times 7 =$
$9 \times 8 =$
$9 \times 9 =$
$9 \times 10 =$

### Written Practice with the 8's and 9's

Copy this combined table of the 8's and the 9's and write the products.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 9 | 10 | 9 | 10 | 8 | 8 | 9 |
| 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 |

Write a problem using the number 8 and another problem using the number 9.

Find the missing numbers in this combined table.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 8 |
| 80 | 64 | 72 | 48 | 81 | 72 | 90 | 63 | 56 |

$? \times 9 = 18$ $9 \times ? = 81$ $5 \times 9 = ?$ $? \times 9 = 36$
$6 \times 9 = ?$ $? \times 9 = 27$ $9 \times ? = 72$ $6 \times ? = 54$

### MULTIPLICATION WITH THE TENS

Make an addition table for the 10's, as the table for the 9's was made.

Copy and complete this table:

10 × 1 =
10 × 2 =
10 × 3 =
10 × 4 =
10 × 5 =
10 × 6 =
10 × 7 =
10 × 8 =
10 × 9 =
10 × 10 =

Supply the missing numbers in this table:

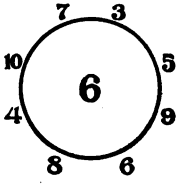
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? | ? | ? |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 30 | 70 | 90 | 50 | 100 | 80 | 60 | 40 |

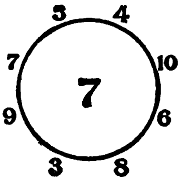
You have now made a separate multiplication table of each number from 2 up to 10. By using the form below, you can put all of these separate tables into one complete table.

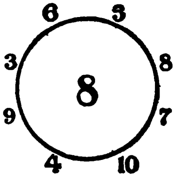
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 2 | ? | 4<br>? | ? | ? | 10<br>? | ? | ? | ? | ? | ? |
| 3 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 4 | ? | ? | ? | ? | ? | 24<br>? | ? | ? | ? | ? |
| 5 | ? | ? | 15<br>? | ? | ? | ? | ? | ? | ? | ? |
| 6 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
| 7 | ? | ? | ? | ? | ? | ? | ? | 56<br>? | ? | ? |
| 8 | ? | ? | ? | 32<br>? | ? | ? | ? | ? | ? | ? |
| 9 | ? | ? | ? | ? | ? | ? | ? | ? | 81<br>? | ? |
| 10 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |

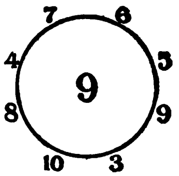
**The small guide figures show that the products are to be written where the horizontal and vertical lines meet.**

### ORAL REVIEW DRILL ON THE MULTIPLICATION TABLE FOR THE BLACKBOARD AND THE DESK









1. Multiply each number on the outside of the first circle by 2, moving to the right.

2. Multiply each number on the outside of the first circle by 2, moving to the left.

3. In the same way multiply by 3, by 4, and by 5.

4. Multiply each number on the outside of each circle by the inside number, moving first to the right then to the left.

5. Multiply each number on the outside of the last circle by 10, moving first to the right, then to the left.

This arrangement brings in every multiplication fact above 2 × 2 which the children have learned.

As the pupils become more proficient, the drill may be varied by *combining addition with multiplication.* For example, the pupil pointing to the outside figure, (or the teacher pointing and the class answering) will say, 30, 54, 24, 36, etc. Then (if 7 is the number to be added) 30, 37; 54, 61; 24, 31; 36, 43; etc.

The short way of adding 9 (10 less 1) may be practiced.

Subtraction also may be combined with multiplication in these drills.

Another simple variation in this blackboard drill is an occasional substitution of the square, diamond or triangle for the circle.

This work should be brisk and snappy. Timing enlivens it. If the work is quick, the drill periods should be *short,* but frequent.

It takes real skill to keep a whole class working at once, in either concert or individual recitations. Do not let a few do all the work.

It will be profitable, at this time, to devote one or more recitations to a review of addition and subtraction.

## WRITTEN MULTIPLICATION

### I

**1.** In a certain school there are three third grade classes. There are 21 children in each class. How many children are there in that third grade?

$$\begin{array}{r} 21\\ 21\\ \underline{21}\\ 63 \end{array}$$

A shorter way to find the answer is by multiplication.

$$\begin{array}{r} 21\\ \underline{3}\\ 63 \end{array}$$

In the same way find:

| **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** |
|---|---|---|---|---|---|---|
| 42 | 84 | 71 | 90 | 53 | 123 | 241 |
| 3 | 2 | 4 | 6 | 3 | 3 | 2 |

| **9.** | **10.** | **11.** | **12.** | **13.** | **14.** |
|---|---|---|---|---|---|
| 804 | 923 | 640 | 732 | 434 | 932 |
| 2 | 3 | 2 | 3 | 2 | 3 |

| **15.** | **16.** | **17.** | **18.** | **19.** | **20.** |
|---|---|---|---|---|---|
| 531 | 712 | 811 | 624 | 912 | 833 |

Additional drill on this type is given on page 113, I.

### II

**1.** Marjorie's father works in a large city 18 miles from his home. He rides back and forth each day on a fast train. How many miles does he ride in one day?[1]

---

[1] This introduces the second type of problems in multiplication. Explain that in the multiplication, the one ten in units column is written with the tens, just as in addition. For further drill on this type see p. 113, II.

In the same way work:

| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|
| 29 | 45 | 94 | 64 | 35 | 58 | 76 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| 8. | 9. | 10. | 11. | 12. | 13. | 14. |
|---|---|---|---|---|---|---|
| 318 | 415 | 206 | 309 | 208 | 145 | 136 |
| 4 | 5 | 7 | 8 | 7 | 2 | 2 |

| 15. | 16. | 17. | 18. | 19. | 20. | 21. |
|---|---|---|---|---|---|---|
| 217 | 625 | 715 | 827 | 412 | 319 | 519 |
| 5 | 6 | 4 | 3 | 8 | 4 | 5 |

## III

A city block is $\frac{1}{8}$ of a mile or 660 ft. long. How many feet are there in 4 city blocks?[1]

$$\begin{array}{r}660\\660\\660\\\underline{660}\end{array}\qquad\qquad\begin{array}{r}660\\\underline{\quad 4}\end{array}$$

In the same way work:

| 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|
| 490 | 360 | 840 | 750 | 280 | 540 |
| 6 | 7 | 3 | 5 | 8 | 8 |

| 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|
| 1270 | 2290 | 1150 | 2140 | 5370 | 8070 |
| 3 | 3 | 4 | 6 | 2 | 9 |

[1] This introduces the third type of problems in multiplication. It may be explained very simply by comparison with the addition problem.

For further drill on this type, see p. 113, III.

## WRITTEN MULTIPLICATION

### IV

There are 365 days in a year. How many days are there in 4 years?[1]

$$\begin{array}{r}365\\365\\365\\\underline{365}\end{array}\qquad\qquad\begin{array}{r}365\\\underline{4}\end{array}$$

| 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|
| 264 | 173 | 314 | 420 | 367 | 458 |
| 3 | 4 | 8 | 7 | 8 | 7 |

| 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|
| 458 | 697 | 298 | 1239 | 1357 | 1492 |
| 9 | 6 | 9 | 6 | 9 | 7 |

### Written Practice in Multiplication

| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|
| 36 | 45 | 87 | 68 | 79 | 88 | 904 |
| 9 | 4 | 3 | 7 | 6 | 5 | 8 |

| 8. | 9. | 10. | 11. | 12. | 13. |
|---|---|---|---|---|---|
| 709 | 304 | 6047 | 3026 | 1248 | 8129 |
| 7 | 9 | 2 | 3 | 2 | 3 |

| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|
| 940 | 980 | 870 | 560 | 890 | 460 | 360 |
| 8 | 6 | 9 | 5 | 7 | 3 | 9 |

---

[1] This involves the fourth type of problems in multiplication: A combination of types 2 and 3. For more problems, see p. 113, IV.

Find the products:

| 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|
| 738 | 956 | 329 | 768 | 904 | 380 |
| 6 | 7 | 5 | 4 | 9 | 8 |

| 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|
| 1864 | 3986 | 4208 | 6054 | 5870 | 2965 |
| 7 | 8 | 6 | 9 | 5 | 3 |

| 13. | 14. | 15. | 16. | 17. | 18. |
|---|---|---|---|---|---|
| 2548 | 3075 | 4298 | 3879 | 2058 | 3049 |
| 5 | 9 | 7 | 9 | 7 | 9 |

**Problems 7 to 18 come under type IV, by further application of the principle already developed.**

## MULTIPLICATION WITH TWO FIGURE MULTIPLIER

10 × 4 ? 10 × 8 ? 10 × 9 ? 10 × 3 ?
10 × 6 ? 10 × 5 ? 10 × 7 ? 10 × 10 ?

What figure do you notice in each product?

Can you tell an easy way to multiply these numbers by 10?

10 × 34 ? 10 × 85 ? 10 × 79 ? 10 × 50 ?
10 × 28 ? 10 × 63 ? 10 × 40 ? 10 × 92 ?

Read the products of these numbers multiplied by 10.

**1.** 98 **2.** 60 **3.** 125 **4.** 239 **5.** 340 **6.** 709
**7.** 76 **8.** 49 **9.** 356 **10.** 120 **11.** 208 **12.** 121

**If necessary, give more examples to show that an easy way to multiply by ten is to annex a 0 to the multiplicand.**

**Give problems like these, solving as if the 10 were a 1 place multiplier.**

$$\begin{array}{r} 36 \\ \underline{10} \\ 360 \end{array} \qquad \begin{array}{r} 42 \\ \underline{10} \\ 420 \end{array}$$

## WRITTEN MULTIPLICATION

**1.** A yard is 36 inches. How many inches in 20 yards? In 20 yards there are 20 × 36 inches = — inches?[1]

**2.** A pound is 16 ounces. 40 pounds = — ounces?

**3.** 40 × 135 = **5.** 60 × 247 = **7.** 90 × 742 =
**4.** 369 × 60 = **6.** 472 × 70 = **8.** 895 × 80 =

**9.** There are 32 qts. in a bushel. How many quarts are there in 14 bushels? In 14 bushels there are 14 × 32 qts. = — qts.?[2]

**10.** There are — inches in a yard. How many inches in 15 yards?

**11.** 24 hours are 1 day. In 26 days there are —hours?

Find the products:

| **12.** | **13.** | **14.** | **15.** | **16.** | **17.** | **18.** |
|---|---|---|---|---|---|---|
| 25 | 46 | 62 | 72 | 82 | 36 | 65 |
| 16 | 23 | 54 | 43 | 41 | 25 | 28 |

| **19.** | **20.** | **21.** | **22.** | **23.** | **24.** |
|---|---|---|---|---|---|
| 125 | 146 | 109 | 307 | 625 | 475 |
| 13 | 15 | 24 | 26 | 31 | 42 |

---

[1] Explain in this way: 20 = 2 × 10. Then to multiply by 20 is just the same as finding 2 × 10 times 36. 10 × 36 = 360. 2 × 360 = 720. Then show shorter form. Do not require explanation from pupils.

$$\begin{array}{r}36\\ \underline{20}\\ 720\end{array}$$

[2] Explanation of this type may be as follows: 14 = 4 + 10. Multiplying 32 by 14 is just multiplying it first by 4, then by 10, and adding the two products.

$$\begin{array}{r}32\\ \underline{4}\\ 128\end{array} + \begin{array}{r}32\\ \underline{10}\\ 320\end{array} = \begin{array}{r}128\\ \underline{320}\\ 448\end{array} \quad \text{may be shortened to} \quad \begin{array}{r}32\\ \underline{14}\\ 128\\ \underline{32\phantom{0}}\\ 448\end{array}$$

Explain that the 0 in the second partial product in usual practice is omitted.

### DRILL PROBLEMS IN MULTIPLICATION

| I. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** |
|---|---|---|---|---|---|---|---|---|
| | 94 | 73 | 83 | 92 | 81 | 71 | 62 | 92 |
| | 2 | 3 | 2 | 4 | 5 | 6 | 2 | 3 |

| II. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** |
|---|---|---|---|---|---|---|---|---|
| | 39 | 48 | 34 | 65 | 65 | 75 | 62 | 29 |
| | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 |

| III. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** |
|---|---|---|---|---|---|---|---|
| | 450 | 960 | 602 | 504 | 700 | 900 | 590 |
| | 3 | 4 | 3 | 2 | 6 | 4 | 5 |

| IV. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|---|
| | 304 | 827 | 4028 | 3927 | 4260 | 1602 |
| | 4 | 3 | 5 | 6 | 8 | 7 |
| | **7.** | **8.** | **9.** | **10.** | **11.** | **12.** |
| | 2654 | 3298 | 5962 | 6254 | 9820 | 6079 |
| | 4 | 3 | 7 | 9 | 6 | 8 |

**13-18.** Multiply 9628 by 3; by 5; 9; 6; 8; 7.

**19-26.** Multiply 26,087 by 6; 9; 3; 8; 5; 7; 2; 4.

**27-34.** Multiply 35,408 by 3; 7; 9; 4; 8; 2; 5; 6.

**35-42.** Multiply 79,008 by 2; 9; 5; 3; 4; 8; 7; 6.

**43-50.** Multiply 62,045 by 3; 6; 2; 4; 8; 7; 5; 9.

**51-56.** Multiply 364, 217 by 2; 5; 7; 6; 4; 3.

**57-63.** Multiply 207,659 by 4; 2; 6; 7; 3; 5.

**64-69.** Multiply 420,931 by 3; 5; 6; 4; 2; 7; 8.

**70.** Find the product of 9 multiplied by 624,108.

## REVIEW PRACTICE PROBLEMS IN MULTIPLICATION

Multiply these numbers:

**1.** 156 × 23
**2.** 271 × 36
**3.** 182 × 42
**4.** 354 × 28
**5.** 279 × 55
**6.** 324 × 47
**7.** 385 × 64
**8.** 280 × 57
**9.** 496 × 45
**10.** 379 × 37
**11.** 524 × 73
**12.** 287 × 96
**13.** 642 × 77
**14.** 524 × 49
**15.** 389 × 67
**16.** 471 × 93
**17.** 722 × 68
**18.** 394 × 87

Multiply as follows:

**1.** 462 × 29
**2.** 325 × 68
**3.** 296 × 72
**4.** 451 × 35
**5.** 385 × 42
**6.** 624 × 56
**7.** 349 × 82
**8.** 465 × 94
**9.** 329 × 87
**10.** 548 × 73
**11.** 287 × 69
**12.** 453 × 74
**13.** 469 × 58
**14.** 732 × 45
**15.** 437 × 88
**16.** 528 × 76
**17.** 825 × 84
**18.** 934 × 73

Find the product of the following:

**1.** 962 × 95
**2.** 854 × 76
**3.** 709 × 84
**4.** 378 × 72
**5.** 360 × 86
**6.** 479 × 73
**7.** 629 × 95
**8.** 758 × 72
**9.** 497 × 84
**10.** 309 × 63
**11.** 620 × 96
**12.** 439 × 57
**13.** 907 × 92
**14.** 428 × 42
**15.** 760 × 65
**16.** 257 × 39
**17.** 408 × 83
**18.** 659 × 48

This page is designed to furnish an abundance of problems for practice from which the teacher may choose what she needs. One effective way to use these problems is to dictate 2 or 3 for rapid calculation each day at the beginning of the recitation.

### Examinations in Multiplication

Before advancing to the next subject, let the class and the teacher, working together, prepare an examination, in the form of test problems, covering the work given on pages 93 to 113. See Suggestions, p. 277.

# DIVISION

## DIVISION WITH THE TWOS

You have learned the facts of division by 2 through 20 ÷ 2. Copy this table, filling in the quotients.

2 ÷ 2 = ?
4 ÷ 2 = ?
6 ÷ 2 = ?
8 ÷ 2 = ?
10 ÷ 2 = ?
12 ÷ 2 = ?
14 ÷ 2 = ?
16 ÷ 2 = ?
18 ÷ 2 = ?
20 ÷ 2 = ?

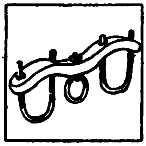
### Problems for Oral Solution

**1.** If Harry earns 2 dimes a day, in how many days will he earn 18 dimes?

**2.** A quart is 2 pints. How many quarts in 16 pints?

**3.** A fortnight is 2 weeks. How many fortnights are there in 2 weeks?

**4.** A yoke answers for 2 oxen. How many yokes are needed for 12 oxen?



**5.** It is 14 miles from one railway station to another. What is one-half of that distance?

What problems can you make about:

20 ÷ 2    12 ÷ 2    18 ÷ 2    16 ÷ 2

You have also learned ½ of every number up to 20. Write the quotients.

½ of 1 ?
½ of 2 ?
½ of 3 ?
½ of 4 ?
½ of 5 ?
½ of 6 ?
½ of 7 ?
½ of 8 ?
½ of 9 ?
½ of 10 ?
½ of 11 ?
½ of 12 ?
½ of 13 ?
½ of 14 ?
½ of 15 ?
½ of 16 ?
½ of 17 ?
½ of 18 ?
½ of 19 ?
½ of 20 ?

What problems can you make using the above facts?

### DIVISION WITH THE THREES

**1.** 4 three's are —? *Think* of making triangles on your desk using 12 pegs. How many triangles could you make? 12 ÷ 3 = ?

**2.** 6 three's are —? How many triangles could you make with 18 pegs? 18 ÷ 3 = ?

**3.** 5 three's are —? How many triangles could you make with 15 pegs? 15 ÷ 3 = ?

**4.** 3 three's are —? If you have 9 apples, you can give how many children 3 apiece? 9 ÷ 3 = ?

**5.** 10 three's are —? There are 30 children in a room. When arranged 3 abreast, their line will be — "deep?" 30 ÷ 3 = ?

**6.** 8 three's are —? 24 children standing 3 abreast make a line — "deep?"24 ÷ 3 = ?

**7.** 9 three's are —? 27 children standing 3 abreast form a line — "deep?" 27 ÷ 3 = ?

**8.** 7 three's are —? A man gave each of his children 3 cents. It took 21 cents to go around. How many children had he? 21 ÷ 3 = ?

**9.** 2 three's are —? With 6 cookies — children can have 3 cookies apiece? 6 ÷ 3 = ?

The teacher should bear in mind the difference between the division problems on this page and those on p. 117. The first illustrates measurement; the second, partition. Children more often have trouble with the measurement type of division. For this reason the use of objects is justified even in third grade, if the children do not seem to see the difference between measuring one quantity by another, and dividing it into a given number of equal parts.

**1.** Suppose you wish to divide a large apple equally among 2 playmates and yourself. You will cut it as nearly as you can into — pieces. Each piece is one-third of the whole apple.

**2.** If you divide an orange into 3 equal parts, each part is — of the whole orange.

**3.** Bruce, Robert and Sidney each had one-third of a small pie. Into how many pieces was the pie cut?

**4.** One-third is also written $\frac{1}{3}$.

**5.** How could you find $\frac{1}{3}$ of a cake?

**6.** How could you find $\frac{1}{3}$ of a yard of ribbon?

**7.** Suppose you did not wish to cut the ribbon into three pieces. How could you use $\frac{1}{3}$ of the yard?

**8.** John's mother equally divided 6 apples among 3 boys. Each boy had $\frac{1}{3}$ of 6 apples or — apples?

**9.** A man equally divided 15 cents among his three children. He gave each one $\frac{1}{3}$ of — cents?

**10.** 3 boys equally divided a dozen pieces of candy. Each one's share was what part of — pieces?

**11.** There are 24 hours in a day. In $\frac{1}{3}$ of a day there are — hours?

**12.** Roger skated 9 miles one day and $\frac{1}{3}$ as far the second. The second day he skated — miles.

**13.** A certain express train travels 30 miles in half an hour, while a local goes only $\frac{1}{3}$ as many miles in the same time. In half an hour the local travels — miles.

$\frac{1}{3}$ of 24 = $\frac{1}{3}$ of 15 = $\frac{1}{3}$ of 30 = $\frac{1}{3}$ of 12 =

## DIVISION WITH THE THREES

**1.** Victoria joined a Christmas savings club and saved $21 in a year. At the end of this time she drew out $\frac{1}{3}$ of her money. She drew out — .

**2.** A yard = — feet. Mary used $\frac{1}{3}$ of a yard of ribbon. She used — foot of ribbon.

**3.** Georgia is 9 years old. Her baby brother is $\frac{1}{3}$ her age. He is — years old.

**4.** Janet had 18 roses. She put $\frac{1}{3}$ of them in a vase. How many did she use in the vase?

**5.** Two villages are 18 miles apart. Some boys on a hike walked all but $\frac{1}{3}$ of this distance. How far did they ride on the train?

**6.** $\frac{1}{3}$ of a line 27 inches long = — inches.

$\frac{1}{3}$ of 21 = ?
$\frac{1}{3}$ of 18 = ?
$\frac{1}{3}$ of 3 = ?
$\frac{1}{3}$ of 9 = ?
$\frac{1}{3}$ of 27 = ?

Make some more problems using the above division facts.

Supply the missing terms:

$\frac{1}{3}$ of ? = 9
$\frac{1}{3}$ of ? = 3
$\frac{1}{3}$ of ? = 6
$\frac{1}{3}$ of ? = 7
$\frac{1}{3}$ of ? = 1
$\frac{1}{3}$ of ? = 10
$\frac{1}{3}$ of ? = 8
$\frac{1}{3}$ of ? = 4
$\frac{1}{3}$ of ? = 2
$\frac{1}{3}$ of ? = 5

Write the division table in order supplying the answers:

1 = $\frac{1}{3}$ of ?
2 = $\frac{1}{3}$ of ?
3 = $\frac{1}{3}$ of ?
4 = $\frac{1}{3}$ of ?
5 = $\frac{1}{3}$ of ?
6 = $\frac{1}{3}$ of ?
7 = $\frac{1}{3}$ of ?
8 = $\frac{1}{3}$ of ?
9 = $\frac{1}{3}$ of ?
10 = $\frac{1}{3}$ of ?

## DIVISION WITH THE THREES

Copy and complete this division table:

$3 \div 3 = ?$
$6 \div 3 = ?$
$9 \div 3 = ?$
$12 \div 3 = ?$
$15 \div 3 = ?$
$18 \div 3 = ?$
$21 \div 3 = ?$
$24 \div 3 = ?$
$27 \div 3 = ?$
$30 \div 3 = ?$

### Problems for Oral Solution

1. There are 3 months in a season. How many seasons are there in a year?

2. If I have 15 candles, how many will there be for each of 3 candlesticks?

3. If Harry earns 3 dimes a day, in how many days will he earn 27 dimes?

4. A league is 3 miles. A ship 24 miles distant is how many leagues away?

5. Philip is 18 years old, and his brother is one-third as old. How old is the brother?

6. A man becomes a voter at the age of 21. How old is he at one-third of that age?

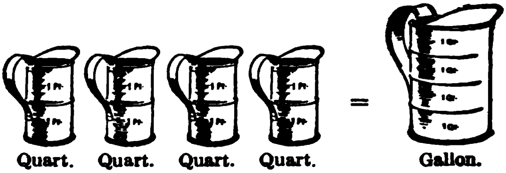
### Written Practice with the 3's

Copy the division table of the 3's in this way and write the quotient below the short line.

$3)\underline{3}$
$3)\underline{6}$
$3)\underline{9}$
$3)\underline{12}$
$3)\underline{15}$
$3)\underline{18}$
$3)\underline{21}$
$3)\underline{24}$
$3)\underline{27}$
$3)\underline{30}$

The quotient is sometimes placed above the dividend in this way $3)\overline{9}$. We may find it well to use it this way very generally when we come to work with large numbers.

## DIVISION WITH THE FOURS



There are — quarts in 1 gallon.

1. 2 four's are ? 8 quarts = — gallons. 8 ÷ 2 = ?

**Prove this answer and some of the following by measuring sand or water with the quart and gallon measures.**

2. 5 fours are ? 20 quarts are — gallons. 20 ÷ 4 = ?
3. 3 fours are ? 12 quarts are — gallons. 12 ÷ 4 = ?
4. 8 fours are ? 32 quarts are — gallons. 32 ÷ 4 = ?
5. 4 fours are ? 16 quarts are — gallons. 16 ÷ 4 = ?
6. 6 fours are ? 24 quarts are — gallons. 24 ÷ 4 = ?
7. 9 fours are ? 36 quarts are — gallons. 36 ÷ 4 = ?
8. 7 fours are ? 28 quarts are — gallons. 28 ÷ 4 = ?
9. 10 fours are ? 40 quarts are — gallons. 40 ÷ 4 = ?

Four "quarters" = 1 dollar.

1. 40 quarters = — dollars. 40 ÷ 4 =
2. 12 quarters = — dollars. 12 ÷ 4 =
3. 20 quarters = — dollars. 20 ÷ 4 =
4. 28 quarters = — dollars. 28 ÷ 4 =
5. 8 quarters = — dollars. 8 ÷ 4 =
6. 24 quarters = — dollars. 24 ÷ 4 =
7. 32 quarters = — dollars. 32 ÷ 4 =
8. 16 quarters = — dollars. 16 ÷ 4 =
9. 36 quarters = — dollars. 36 ÷ 4 =

**1.** Marjorie is making ribbon badges for a little club to which she belongs. Each badge requires 4 inches of ribbon. How many can she cut from a yard or 36 inches?

$$36 \div 4 = ?$$

**2.** 40 children marching 4 abreast make a line — "deep." $40 \div 4 = ?$

**3.** 32 children marching 4 abreast make a line— "deep." $32 \div 4 = ?$

**4.** There were 16 pieces of fudge in a pan. — children could have 4 pieces each. $16 \div 4 = ?$

**5.** How many strips 4 inches wide can you cut from a piece of paper 12 inches wide? $12 \div 4 = ?$

**6.** How can one find $\frac{1}{4}$ of a thing? Is it necessary to cut or divide the whole into 4 fourths to find $\frac{1}{4}$?

**7.** Bob earned $8 picking strawberries. He spent $\frac{1}{4}$ of his money for a pair of shoes. His shoes cost — ?

**8.** Mother equally divided a small cake among Robert and 3 playmates. Each one received what part of the cake?

**9.** Think of making squares with pegs. How many squares could you make with 20 pegs?—with 8?—with 24?—with 28?

**10.** There were 40 erasers in the cupboard. Victor put $\frac{1}{4}$ of them in the chalk trays. He took out $\frac{1}{4}$ of 40 erasers, or — erasers?

**11.** If you divide an orange equally among 4 children, you divide it as nearly as you can into — equal parts. Each part is —, or $\frac{1}{4}$ of the whole orange.

## DIVISION WITH THE FOURS

Copy and complete this division table.

4 ÷ 4 =
8 ÷ 4 =
12 ÷ 4 =
16 ÷ 4 =
20 ÷ 4 =
24 ÷ 4 =
28 ÷ 4 =
32 ÷ 4 =
36 ÷ 4 =
40 ÷ 4 =

Supply the answers in this table:

$\frac{1}{4}$ of 4 =
$\frac{1}{4}$ of 12 =
$\frac{1}{4}$ of 16 =
$\frac{1}{4}$ of 36 =
$\frac{1}{4}$ of 28 =
$\frac{1}{4}$ of 40 =
$\frac{1}{4}$ of 8 =
$\frac{1}{4}$ of 24 =
$\frac{1}{4}$ of 20 =
$\frac{1}{4}$ of 32 =

### Problems for Oral Solution

1. A bushel = 32 quarts. $\frac{1}{4}$ bushel = — quarts.

2. Robert earned 12 dollars in 4 weeks. How much did he earn each week?

3. Harry earned 28 cents in 4 hours. How much was that for each hour?

4. If Frank earns 4 dollars a week, in how many weeks will he earn 20 dollars?

5. A man set out 36 plants in 4 rows. How many were there in each row?

6. Counting 5 school days to a week, how many weeks must there be for 40 school days?

7. Four girls make 24 wreaths to decorate a hall. That number is how many for each girl?

8. The President's term of office is 4 years. How many such terms are there in 16 years?

1. A year is — months. A "quarter" or $\frac{1}{4}$ year is — months.

2. In the box there were 28 drawing pencils. $\frac{1}{4}$ of them were worn down. How many needed sharpening?

3. In throwing at a mark, Richard hit it $\frac{1}{4}$ out of 16 times. How many times did he hit the mark in 16 trials?

4. There were 40 drawing pencils in a holder. $\frac{1}{4}$ of them needed sharpening. How many pencils needed sharpening?

5. John had 36 mixed tulips in his garden. When they blossomed, he found that $\frac{1}{4}$ of them were red. How many red tulips had he?

6. There were 24 children in a third grade class. $\frac{1}{4}$ of them were neither absent nor tardy for a term. How many had perfect records?

7. There were 20 May baskets to be filled with flowers. Marguerite filled $\frac{1}{4}$ of them with violets. How many did she fill with violets?

### Written Practice Work with the 4's

Copy the table of the 4's in this form and supply the answers.

$4\overline{)8}$  $4\overline{)20}$  $4\overline{)36}$  $4\overline{)40}$  $4\overline{)28}$

$4\overline{)16}$  $4\overline{)4}$  $4\overline{)12}$  $4\overline{)24}$  $4\overline{)32}$

Copy this table and write the missing terms.

$\frac{1}{4}$ of ? = 4
$\frac{1}{4}$ of ? = 8
$\frac{1}{4}$ of ? = 2
$\frac{1}{4}$ of ? = 6

$\frac{1}{4}$ of ? = 7
$\frac{1}{4}$ of ? = 1

$\frac{1}{4}$ of ? = 3
$\frac{1}{4}$ of ? = 9
$\frac{1}{4}$ of ? = 5
$\frac{1}{4}$ of ? = 10

### DIVISION WITH THE FIVES

**1.** 2 five's are ? 10 school days — school weeks.

$10 \div 5 = ?$

**2.** 7 five's are ? 35 school days — school weeks.

$35 \div 5 = ?$

**3.** 4 five's are ? 20 school days — school weeks.

$20 \div 5 = ?$

**4.** 10 five's are ? 50 children marching 5 abreast make a column — deep.

$50 \div 5 = ?$

**5.** 8 five's are ? 40 children marching 5 abreast make a column — deep.

$40 \div 5 = ?$

**6.** 6 five's are ? John is planting tomato plants 5 in a row. With 30 plants he has enough for — rows.

$30 \div 5 = ?$

**7.** 9 five's are ? With 45 plants he has enough for — rows?

$45 \div 5 = ?$

**8.** 3 five's are ? At $0.05 each, one can buy — loaves of bread for $0.15.

**9.** At $0.05 each, how many loaves of bread can one buy for the following:

$0.30 $0.10 $0.40 $0.15
$0.25 $0.35 $0.20 $0.45

**10.** A nickel = 5 cents. How many nickels in the following?

$0.15 $0.35 $0.25 $0.40 $0.30 $0.45 $0.20

Complete this table of the 5's.

$5 \div 5 = 1$
$? \div 5 = 2$
$? \div 5 = 3$
$? \div 5 = 4$
$? \div 5 = 5$
$? \div 5 = 6$
$? \div 5 = 7$
$? \div 5 = 8$
$? \div 5 = 9$
$? \div 5 = 10$

We find $\frac{1}{5}$ of any whole by dividing that whole into — equal parts. Or if we do not actually cut it, we may *think* of it as being divided into — equal parts.

**1.** If your mother gives you $\frac{1}{5}$ of a pie, the whole, which is divided into — equal parts is the pie.

**2.** If she gives you $\frac{1}{5}$ of \$0.25, the whole which is divided is the \$0.25.

**3.** There were 40 martins on a telegraph wire. $\frac{1}{5}$ flew away. How many took flight?

**4.** There were 20 people in an elevator. 4 got out at the 3rd floor. This is what part of the people in the elevator?

**5.** $\frac{1}{5}$ of 55 children left one pencil each for the monitor to sharpen after school. In all there were — pencils to be sharpened.

### Written Practice with the 5's

Copy the table of the 5's in this form and write the answers.

$5\overline{)15}$ $5\overline{)25}$ $5\overline{)40}$ $5\overline{)35}$
$5\overline{)30}$ $5\overline{)20}$ $5\overline{)25}$ $5\overline{)50}$

Make problems using the following:

**1.** $\frac{1}{5}$ of 10 apples
**2.** $\frac{1}{5}$ of 20 books
**3.** $\frac{1}{5}$ of 15 cows
**4.** $\frac{1}{5}$ of 45 children

### DIVISION WITH THE SIXES

**1.** 6 six's are ? How many pieces 6 inches long can be cut from a yard of ribbon? 36 ÷ 6 = ?

**2.** 9 six's are ? 54 children marching 6 abreast make a column — deep. 54 ÷ 6 = ?

**3.** 10 six's are ? 60 children marching 6 abreast make a column — deep. 60 ÷ 6 = ?

**4.** 4 six's are ? 24 pounds of sugar will make how many 6 lb. packages? 24 ÷ 6 = ?

**5.** 7 six's are ? At 6c a card, one can buy — cards of buttons for $0.42. 42 ÷ 6 = ?

**6.** 3 six's are ? 18 chairs arranged 6 in a row make — rows. 18 ÷ 6 = ?

**7.** 5 sixes are ? 30 apples = — half dozens?
30 ÷ 6 = ?

**8.** 8 six's are ? 48 inches = — half feet.
48 ÷ 6 = ?

**9.** 2 six's are ? A dozen pansy plants planted 6 in a row make — rows? 12 ÷ 6 = ?

**10.** 4 six's are ? 24 fruit trees planted 6 in a row make — rows. 24 ÷ 6 = ?

**11.** The ruler in John's pencil box is only 6 inches long. How many times must he lay it down in measuring a line 6 inches long; in measuring a line 24 inches long; in one 42 inches long; in one 12 inches; 36 inches; 18 inches; 30 inches; 48 inches; 60 inches; 54 inches?

Copy and complete the division table:

$12 \div 6 = ?$ $30 \div 6 = ?$ $48 \div 6 = ?$
$18 \div 6 = ?$ $36 \div 6 = ?$ $54 \div 6 = ?$
$24 \div 6 = ?$ $42 \div 6 = ?$ $60 \div 6 = ?$

### Problems for Oral Solution

**1.** Edwin saved $0.30, then spent $\frac{1}{6}$ of his money for some oranges. How much did he spend?

**2.** There were 18 eggs in a bowl. The cook used $\frac{1}{6}$ of them for a custard. How many did she use?

**3.** There are 48 children in a room. One rainy day $\frac{1}{6}$ of them were absent. How many were absent?

**4.** John's father gave him 36 little chickens for a birthday present. He succeeded in raising all except $\frac{1}{6}$ of them. How many did he lose?

**5.** At a candy sale, 6 pieces of candy were sold in a bag for a nickel. How many bags did each of the following kinds of candy fill?

36 butterscotch; 54 chocolate fudge; 60 molasses; 24 cocoanut bars; 30 peanut brittle; 48 cream taffy candy?

### Written Practice with the 6's

Copy this table and write the answers:

$6\overline{)24}$ $6\overline{)42}$ $6\overline{)48}$ $6\overline{)54}$
$6\overline{)30}$ $6\overline{)18}$ $6\overline{)36}$ $6\overline{)60}$

Make problems using these number facts.

$\frac{1}{6}$ of 12 stones = ? $\frac{1}{6}$ of $0.60 = ?
$\frac{1}{6}$ of 42 children = ? $\frac{1}{6}$ of 54 children = ?

### DIVISION WITH THE SEVENS

**1.** 8 sevens are ? 56 chairs arranged 7 in a row make — rows?

**2.** 9 sevens are ? William uses 63 blocks in building a platform 7 blocks wide. His platform is — blocks long?

$56 \div 7 = ?$ $63 \div 7 = ?$

**3.** 3 sevens are ? A certain Christmas card with the envelope and stamp costs $0.07. How many can one buy and send for $0.21? For $0.42?

$21 \div 7 = ?$ $42 \div 7 = ?$

**4.** 2 sevens are ? Marjorie, putting away jelly in the fruit closet found the shelves were long enough for just 7 glasses. She packed 14 glasses in — rows? 49 glasses filled — rows?

$14 \div 7 = ?$ $49 \div 7 = ?$

**5.** One day $\frac{1}{7}$ of the 28 children in a grade were absent. — were not at school?

$\frac{1}{7}$ of $28 = ?$

**6.** Wilbur used $\frac{1}{7}$ of $14.00 he had saved, to give some poor children Christmas presents. He gave —.

$\frac{1}{7}$ of \$14.00 = ?

**7.** Rose counted 35 school days before Christmas vacation. When $\frac{1}{7}$ of this time had passed, how many days had gone by?

$\frac{1}{7}$ of $35 = ?$

**8.** A party which had started on a 70-mile auto trip, after going $\frac{1}{7}$ of this distance, was obliged to stop because of a puncture. How far had they gone? $\frac{1}{7}$ of $70 = ?$

Copy and complete this table:

14 ÷ 7 = ?
21 ÷ 7 = ?
28 ÷ 7 = ?

35 ÷ 7 = ?
42 ÷ 7 = ?
49 ÷ 7 = ?

56 ÷ 7 = ?
63 ÷ 7 = ?
70 ÷ 7 = ?

Supply the missing numbers in this table:

? ÷ 7 = 6
? ÷ 7 = 2
? ÷ 7 = 7
? ÷ 7 = 4

? ÷ 7 = 5
? ÷ 7 = 10

? ÷ 7 = 8
? ÷ 7 = 3
? ÷ 7 = 9
? ÷ 7 = 1

Supply the missing numbers in this table:

$\frac{1}{7}$ of ? = 4
$\frac{1}{7}$ of ? = 6
$\frac{1}{7}$ of ? = 1
$\frac{1}{7}$ of ? = 8

$\frac{1}{7}$ of ? = 2
$\frac{1}{7}$ of ? = 7

$\frac{1}{7}$ of ? = 5
$\frac{1}{7}$ of ? = 9
$\frac{1}{7}$ of ? = 3
$\frac{1}{7}$ of ? = 10

Supply the missing numbers:

5 sevens are ?
10 sevens are ?
4 sevens are ?

35 days = — weeks.
70 days = — weeks.
28 days = — weeks.

**Written Practice with the *7*'s**

$7\overline{)28}$ $7\overline{)21}$ $7\overline{)56}$ $7\overline{)70}$

$7\overline{)35}$ $7\overline{)42}$ $7\overline{)49}$ $7\overline{)63}$

Make problems using the following:

$\frac{1}{7}$ of 21 apples
$\frac{1}{7}$ of 49 books
$\frac{1}{7}$ of 63 pencils

$\frac{1}{7}$ of 56 eggs
$\frac{1}{7}$ of 42 erasers
$\frac{1}{7}$ of 7 dollars.

9 sevens are ?
7 sevens are ?
3 sevens are ?

63 days are — weeks.
49 days are — weeks.
21 days are — weeks.

## DIVISION WITH THE EIGHTS, NINES AND TENS

To the Teacher:—You will find it not only interesting but very profitable to let your pupils "make their own book" for the remainder of this work in division.

Since a regular and simple order has been followed in the development of the preceding tables, with a little help the children should be able to work out the pages for division with 8's, 9's and 10's. The class working together may first decide what should go on a page. Then the work may be assigned to different pupils to work out.

If you have a print shop in your school, it would be a great incentive to have the children's "book" put together in some permanent form. It is sometimes possible to have it typewritten. Even a complete copy in writing is an end which will add interest.

The following outline may serve as a help in "making the book." *The concrete problems are not necessarily to be exact copies of the originals with different numbers substituted.* However, the order of quotients may be observed and the type of problems duplicated. For example from: "Georgia is 9 years old. Her baby brother is ⅓ her age. He is — years old," one could make "24 cows were in a pasture. ⅛ got out into the lane. There were — cows in the lane."

### DIVISION WITH EIGHT

Plan a page like p. 120 using 8 instead of 4, and changing quarts to pecks instead of to gallons. Omit drill at bottom.

Plan a page like p. 121 using 8 instead of 4.

Plan a page like p. 122 using 8 instead of 4.

Plan a page like p. 123 using 8 instead of 4.

### DIVISION WITH NINE

Work out a page like p. 126. Omit drill at bottom.

Work out a page like p. 127. As a substitute for example 5 form the children into baseball "nines."

### DIVISION WITH TEN

Like p. 124. In example 9 let loaves cost $0.10. In example 10, use 10 cents = 1 dime.

**1.** What is $\frac{1}{10}$ of 80; 60; 40; 100; 70; 30?

**2.** In 50 cents there are — dimes. 80 cents = — dimes?

**3.** Forty units are — tens. 100 units are — tens.

**4.** Read quotients as quickly as you can—

8)24 8)48 8)16 8)32 8)40
8)56 8)72 8)80 8)64

**5.** There are 8 pints in a gallon. Change to gallons: 48 pints; 24 pints; 16 pints.

**6.** Change to pecks: 32 quarts; 72 quarts; 56 quarts.

**7.** In the crowded city schools there are often 54 children in a room. When they are seated 9 in a row, there are how many rows of desks needed?

**8.** Eighteen boys are enough for how many baseball "nines"?

**9.** Write this line in a column[1]:
63, 0, 9, 36, 54, 18, 45, 63, 27, 81, 90, 72.

**10.** After each number in the column, write as quickly as you can, the quotient of the number divided by 9.

**11.** Copy these numbers in a column:
1, 4, 6, 2, 9, 7, 0, 8, 5, 3, 10.

**12.** After each write the product of the number multiplied by 9.

[1] This is a drill exercise, which may be adapted for addition and subtraction as well as division and multiplication. The children can be trained to write the answers very rapidly without taking their eyes off the column on the board. The order of the numbers in the column should be changed often. To divide the multiples of 9, for example, by 8, writing remainders, affords good practice in short division.

### WRITTEN DIVISION

1. On Rupert's 12th birthday, his father gave him ½ of $24 with which to start a savings account. How much did Rupert have to put in the bank?[1]

2. There were 36 cookies in the jar. Mother gave Helen ⅓ of them for a picnic. Helen had — cookies?

3. There are 28 children in a room. When ½ are at the board, how many are in their seats?

4. Fred's hens laid 48 eggs in 4 days. That was an average of how many each day?

5. There were 26 potatoes left in the basket. The cook used ½ of them. How many did she use?

6. There were 5 dozen carnations cut at the florists. A lady bought ½ of them. How many did she get?

7. Roger spent ⅓ of $0.96 which he had saved. How much did he spend?

| **8.** | **9.** | **10.** | **11.** | **12.** |
|---|---|---|---|---|
| 2)68 | 3)69 | 2)86 | 4)84 | 2)22 |
| **13.** | **14.** | **15.** | **16.** | **17.** |
| 2)468 | 3)336 | 3)693 | 2)664 | 3)360 |
| **18.** | **19.** | **20.** | **21.** | **22.** |
| 4)408 | 2)640 | 3)609 | 2)806 | 5)500 |

---

[1] This problem is to introduce the first type in written "short division," which involves no reduction. When the children see they do not know ½ of $24, the teacher may explain: $2\overline{)24}$ "½ of 2 tens = 1 ten. We write the 1 ten under the ten's column, ½ of 4 units = 2 units. Write the 2 in unit's place, ½ of 24 = 12. We find ½ of $24 or 24 apples or 24 of anything in just the same way." For more problems of this type, see p. 135, I. Just as soon as it seems wise, encourage the children *to see the quotient* in such problems without writing it.

**1.** Howard had 54 chickens, of which he sold $\frac{1}{2}$. How many did he sell?[1]

**2.** Marion's mother gave her $\frac{1}{4}$ of the books on a shelf with which to start her own library. There were 56 books on the shelf. How many did Marion receive?

**3.** The children in a geography class together bought a set of 124 post cards to use in their Mirroscope. $\frac{1}{4}$ of the cards were views of New York City. $\frac{1}{6}$ were pictures of Chicago. $\frac{1}{3}$ were scenes in Yellowstone Park and the Rocky Mountains. The rest were on different subjects. How many views of New York were there?

**4.** How many cards were pictures of Chicago?

**5.** How many were scenes in Yellowstone Park and the Rocky Mountains?

**6.** 384 children in a certain school went at different times during a month to visit a museum. Once $\frac{1}{6}$ of them went; another time $\frac{1}{8}$ of them. How many went the first time?

**7.** How many were in the group the second time?

In the same way work:

**1.** 6)960 **2.** 5)605 **3.** 3)426 **4.** 8)744 **5.** 2)574
**6.** 3)744 **7.** 4)952 **8.** 5)260 **9.** 6)384 **10.** 4)912
**11.** 3)1023 **12.** 4)5112 **13.** 2)3132 **14.** 3)5706 **15.** 4)6072
**16.** 5)2620 **17.** 9)2808 **18.** 8)3304 **19.** 4)5008

---

[1] This is a simple example of division which involves reduction. Explain that $\frac{1}{2}$ of 5 tens = 2 with 1 remaining. The 2 is written under the other tens. The 1 ten remaining is added to the 4 units. $\frac{1}{2}$ of 14 units = — units. The 7 is written in units' place. Do not require an explanation from the pupils. For further drill on this type, see p. 135, II.

### 0 IN THE QUOTIENT

**1.** 6)624
**2.** 7)728
**3.** 5)530
**4.** 4)824
**5.** 3)621
**6.** 2)216

**7.** 9)6327
**8.** 6)3624
**9.** 9)1845
**10.** 9)2754
**11.** 8)6416
**12.** 5)2540

**13.** 3)32106
**14.** 6)24126
**15.** 4)5628
**16.** 2)16184
**17.** 8)56248

This type of division problem should be emphasized. Children are given to *leaving out* the 0 in the quotient. For more problems, see p. 135, III.

### REMAINDER IN DIVISION

**1.** Read the quotient of the following divided by 6:
12, 60, 18, 36, 648, 24, 54, 42.

**2.** Divide these same numbers by 5, thus:
12 5 2, with 2 remaining.

**3.** Divide them by 7; by 8.

**4.** Read the quotient of the following divided by 4:
5, 9, 13, 17, 22, 26, 31, 35, 39.

**5.** Divide them by 5; by 7.

**6.** 5)624
**7.** 3)425
**8.** 4)673
**9.** 6)985
**10.** 9)296
**11.** 8)457

**12.** 5)9762
**13.** 9)4326
**14.** 7)4325
**15.** 6)7455
**16.** 5)6447

**17.** 6)26591
**18.** 5)32962
**19.** 3)45851
**20.** 4)62587

These problems all have remainders in the quotient. Introduce the fraction form of writing the remainder. In problem 4 for example "The remainder 4, divided by 5 = $\frac{4}{5}$, and is written in the quotient." For further drill on this type, see p. 135, IV.

## DRILL PROBLEMS IN DIVISION

| I. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|---|
| | 2)1684 | 3)6936 | 2)4862 | 4)8484 | 3)6933 | 2)4684 |

| II. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|---|
| | 3)543 | 4)648 | 2)328 | 5)655 | 4)964 | 6)726 |
| | **7.** | **8.** | **9.** | **10.** | **11.** | |
| | 4)568 | 8)896 | 5)585 | 7)784 | 5)696 | |

| III. | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
|---|---|---|---|---|---|---|
| | 5)5295 | 6)6480 | 9)1845 | 6)4854 | 7)4956 | 4)16288 |
| | **7.** | **8.** | **9.** | **10.** | | |
| | 9)36063 | 5)25305 | 7)70497 | 6)54366 | | |
| | **11.** | **12.** | **13.** | **14.** | | |
| | 7)14,210 | 3)24,216 | 8)405,616 | 7)496,314 | | |

| IV. | **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|---|
| | 7)28015 | 4)36105 | 8)94207 | 3)64571 | 5)49806 |
| | **6.** | **7.** | **8.** | **9.** | **10.** |
| | 8)25045 | 5)62361 | 4)960517 | 3)461084 | 6)46215 |
| | **11.** | **12.** | **13.** | **14.** | **15.** |
| | 9)34571 | 6)42015 | 5)376421 | 7)68109 | 8)42015 |

It is not necessary that the children be able to read these numbers. The problems are only for drill in division.

**16-21.** Divide 421,687 by 2; 3; 4; 5; 6; 9.

**22-26.** Divide 960,428 by 3; 5; 6; 8; 9.

**27-32.** Divide 402,457 by 2; 3; 5; 7; 9.

**33-36.** Divide 642,361 by 9; 3; 6; 7; 4.

## REVIEW PRACTICE PROBLEMS IN DIVISION

See Note, p. 114

Find the quotients of the following: Prove by multiplication.

**1.** 39,284 ÷ 2
**2.** 48,246 ÷ 3
**3.** 96,408 ÷ 4
**4.** 45,205 ÷ 5
**5.** 18,612 ÷ 6
**6.** 49,147 ÷ 7
**7.** 30,510 ÷ 5
**8.** 27,306 ÷ 6
**9.** 28,714 ÷ 7
**10.** 64,816 ÷ 8
**11.** 36,208 ÷ 4
**12.** 47,155 ÷ 5
**13.** 20,168 ÷ 8
**14.** 72,909 ÷ 5
**15.** 279,525 ÷ 11
**16.** 430,366 ÷ 6
**17.** 700,217 ÷ 7
**18.** 600,248 ÷ 8

Find the quotients: Prove by multiplication.

**1.** 2)46256
**2.** 3)18972
**3.** 4)24804
**4.** 5)11520
**5.** 6)19836
**6.** 3)27645
**7.** 4)36428
**8.** 5)35505
**9.** 6)72642
**10.** 7)35749
**11.** 4)32436
**12.** 5)26050
**13.** 6)25836
**14.** 7)43456
**15.** 8)41672
**16.** 5)26550
**17.** 6)31848
**18.** 7)73563
**19.** 8)84832
**20.** 9)28881

**1-32.** Divide each of the following numbers by 2; 4; 6; 8.
36421 89208 36098 72540
75602 42675 42187 62598

**33-64.** Divide each of the following by 3; 5; 7; 9.
96208 36724 41237 72965
72058 29005 64781 40027

**65-80.** Divide each of the following by 7; 9; 8; 6.
145,627 945,281 645,067 298,653

### Examinations in Division

Before advancing to the next subject, let the class and the teacher, working together, prepare an examination, in the form of test problems, covering the work given on pages 115 to 135. See Suggestions, p. 277.

### FINDING FRACTIONAL PARTS OF NUMBERS

**1.** Take a strip of paper 12 inches or one foot long.

**2.** If you wish to cut the strip into fourths, how many equal parts do you plan? Show these parts by folding. Without cutting you can see each part is $\frac{1}{4}$ of 12 inches or = — inches. Measure each part with your ruler to see if this is not true.

**3.** Cut the strip into fourths. Again show $\frac{1}{4}$ of the strip. It is — inches long. Can you tell without using the ruler how much $\frac{3}{4}$ of 12 inches are?

Measure to see if you are right.

$\frac{1}{4}$ of 12 =

$\frac{3}{4}$ of 12 =

**4.** Think of a strip 1 yard or 36 inches long. $\frac{1}{4}$ of 36 inches = — inches. $\frac{3}{4}$ of 36 inches = — inches.

Let some one in the class prove your answer by cutting a yard strip into fourths and measuring $\frac{3}{4}$ of it.

**5.** Think of a strip 24 inches long. $\frac{1}{4}$ of 24 inches = — inches. $\frac{3}{4}$ of 24 inches = — inches.

**6.** Think of a dozen eggs. $\frac{1}{4}$ of 12 eggs = — eggs. $\frac{3}{4}$ of 12 eggs = — eggs.

**7.** Prove by letting one pupil show this to the rest using stones or anything else at hand for eggs.

**8.** Think of 16 blocks. $\frac{1}{4}$ of 16 blocks = — blocks. $\frac{3}{4}$ of 16 blocks is —.

$\frac{1}{4}$ of 8 =
$\frac{3}{4}$ of 8 =

$\frac{1}{4}$ of 28 =
$\frac{3}{4}$ of 28 =

$\frac{1}{4}$ of 24 =
$\frac{3}{4}$ of 24 =

$\frac{1}{4}$ of 4 =
$\frac{3}{4}$ of 4 =

$\frac{1}{4}$ of 16 =
$\frac{3}{4}$ of 16 =

$\frac{1}{4}$ of 36 =
$\frac{3}{4}$ of 36 =

$\frac{1}{4}$ of 32 =
$\frac{3}{4}$ of 32 =

$\frac{1}{4}$ of 20 =
$\frac{3}{4}$ of 20 =

### FINDING FRACTIONAL PARTS OF NUMBERS

If you wish to divide a foot of ribbon into thirds, you plan — equal parts. Using a strip of paper for ribbon, show $\frac{1}{3}$ of a foot. Show $\frac{2}{3}$ of it. Can you tell without measuring how much $\frac{2}{3}$ of 12 inches are? Prove you are right.

$\frac{1}{3}$ of 9 = ?
$\frac{2}{3}$ of 9 = ?

$\frac{1}{3}$ of 18 = ?
$\frac{2}{3}$ of 18 = ?

$\frac{1}{3}$ of 30 = ?
$\frac{2}{3}$ of 30 = ?

$\frac{1}{3}$ of 6 = ?
$\frac{2}{3}$ of 6 = ?

$\frac{1}{3}$ of 24 = ?
$\frac{2}{3}$ of 24 = ?

$\frac{1}{3}$ of 15 = ?
$\frac{2}{3}$ of 15 = ?

$\frac{1}{3}$ of 12 = ?
$\frac{2}{3}$ of 12 = ?

$\frac{1}{3}$ of 27 = ?
$\frac{2}{3}$ of 27 = ?

Draw an oblong and show $\frac{1}{3}$ of it. Show $\frac{3}{6}$ of it. Show $\frac{5}{6}$ of the oblong.

If you wish to divide a pie into sixths, you plan — equal parts. Using a circle for the pie show $\frac{1}{6}$ of a pie. Show $\frac{4}{6}$. Show $\frac{5}{6}$.

1.
$\frac{1}{6}$ of 12 = ?
$\frac{5}{6}$ of 12 = ?

2.
$\frac{1}{6}$ of 24 = ?
$\frac{5}{6}$ of 24 = ?

3.
$\frac{1}{6}$ of 30 = ?
$\frac{5}{6}$ of 30 = ?

4.
$\frac{5}{6}$ of 18 = ?

5.
$\frac{5}{6}$ of 6 = ?

6.
$\frac{5}{6}$ of 36 = ?

7.
$\frac{5}{6}$ of 54 = ?

8.
$\frac{5}{6}$ of 42 = ?

9.
$\frac{5}{6}$ of 48 = ?

10. A yard = — inches. $\frac{5}{6}$ yard = — inches.

11. A foot = — inches. $\frac{5}{6}$ foot = — inches.

12. — things = a dozen. $\frac{5}{6}$ dozen = — things.

## ORAL WORK

1. $\frac{1}{2}$ foot = ? inches. $\frac{1}{6}$ foot = ? inches. $\frac{5}{6}$ foot = ?

2. $\frac{3}{4}$ yard = ? inches. $\frac{1}{6}$ yard = ? inches. $\frac{5}{6}$ yard = ?

3. 1 pound = ? ounces. $\frac{1}{2}$ pound = ? ounces. $\frac{1}{4}$ pound = ? ounces.

4. $\frac{1}{8}$ pound = ? ounces. $\frac{3}{8}$ pound = ? ounces. $\frac{5}{8}$ pound = ? ounces.

5. 1 peck = ? quarts. $\frac{1}{2}$ peck = ? quarts. $\frac{3}{4}$ peck = ? quarts.

6. 1 gallon = ? quarts. $\frac{3}{4}$ gallon = ? quarts.

7. 1 bushel = ? quarts. $\frac{3}{4}$ bushel = ? quarts.

8. $\frac{1}{8}$ bushel = ? quarts. $\frac{3}{8}$ bushel = ? $\frac{7}{8}$ bushel = ?

## WRITTEN WORK

Some schools furnish the children's books. There are many volumes to be kept clean and in good condition. Of course some are worn out every year.

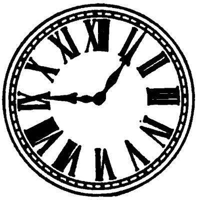
1. In checking up a set of 96 readers, a teacher found that $\frac{5}{6}$ of them were in good condition. How many was that?

2. A set of 84 geographies, which had been used nearly every day by 6 classes, was very much the worse for wear. She found that $\frac{2}{7}$ of them needed rebinding. How many geographies had to have new covers?

3. There were 420 copy-books. $\frac{3}{4}$ of them were out of date. How many old books were there?

4. In all there were 168 first books in arithmetic. $\frac{7}{8}$ of these did not need any repairs. How many arithmetics were in good condition?

## TELLING TIME



How are the hands of your schoolroom clock different? Which one marks the hour? Which one shows the minutes?

Your teacher will tell you when an hour has passed. See where the hour hand is, and where the minute hand is.

Notice each again an hour later. How far has the hour hand traveled? How far has the minute hand gone?

Which moves faster—the hour or the minute hand?

Notice the numbers on the clock. They are called "Roman Numerals."

Which one looks the most like the figure 1?

If I = 1, II = —, and III = —.

Beginning with I, count right around and find what V equals. Find what X equals.

IV = 1 from 5 = ?
VI = 5 plus 1 = ?
VII = 5 + 2 = ?
VIII = 5 + = ?

IX = 1 from 10 = ?
XI = 10 plus 1 = ?
XII = + 2 = ?

Try making a clock face. You can copy the numbering on a paper circle. Then paste this on a cardboard square.

Cut out cardboard hands. If you fasten them on with a pin you can make them move around.

In learning to tell time you will find out these facts:

1 hour = 60 minutes.
½ hour = 30 minutes.
¼ hour = 15 minutes.

The teacher should be provided either with a cardboard clock face, or an old clock, the hands of which she can turn. Teach the hours first, beginning with those the children need to know such as IX, XII, etc. Let them put the clock hands to show the different hours. Develop in turn the half-hours, the quarter hour, five and one minute spaces. At different times during the day ask the children to tell you what time it is.

### PRACTICE WORK IN U. S. MONEY

1. Write the following:

   1. One dollar and sixteen cents.
   2. Two dollars and twenty-five cents.
   3. One dollar and five cents.
   4. Three dollars and eight cents.
   5. One dollar and fifty cents.

In writing, how are the dollars separated from the cents?

   6. Ten dollars and thirty-six cents.
   7. Fifteen dollars and twenty cents.
   8. Twenty-five dollars and seven cents.
   9. Twelve dollars and two cents.
   10. One hundred twenty-five dollars and fifty cents.

2. Copy, read and add the following:

| **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|
| $0.65 | $1.00 | $2.00 | $1.52 | $3.00 |
| .24 | .05 | .84 | .80 | 3.02 |
| .08 | 1.05 | 2.84 | .05 | 1.55 |

| **6.** | **7.** | **8.** | **9.** | **10.** |
|---|---|---|---|---|
| $10.00 | $10.05 | $16.48 | $100.00 | $100.50 |
| 12.00 | 12.25 | 4.09 | 125.00 | 125.75 |
| 25.00 | 25.50 | 17.25 | 150.00 | 150.90 |

Further work of this kind may be supplied in the following ways:
1. Let children write on board or paper, numbers for class to read.
2. Teacher may dictate numbers to be written.
3. Children suggest numbers to be written.

As soon as amounts run into the hundreds, be sure that children do not, say for example—"One hundred *and* twenty-five dollars" or worse yet—"One hunderd'n twenty-five dollars." If this tendency appears, correct it by clear cut pronunciation of the word hundred: "hun-drĕd."

## STORE PROBLEMS

**1.** Fred and his playmates had a picnic at the beach. They roasted corn and potatoes, and broiled bacon on forked sticks. What did their lunch cost altogether?

½ lb. bacon at $0.28 a lb.
18 rolls at $0.12 a dozen.
¼ lb. butter at $0.40 a lb.
½ doz. bananas at $0.20 a doz.
10 cents worth of potatoes.
3 ears of corn at $0.20 a doz.
4 lemons at $0.30 a doz.
Sugar for lemonade $0.02

**2.** There were 6 boys. What was each one's share of the lunch?

A housewife's grocery lists for 4 days were as follows:

**Monday**

½ bu. potatoes at $1.20.
2 lbs. lard at $0.12.
1 25-lb. sack flour at $1.10.
2 qts. vinegar at $0.10.
20 lbs. sugar at $0.07.

**Tuesday**

2 qts. molasses at $0.15.
1 can baking powder at $0.25.
1 box soda at $0.10.
1 doz. eggs at $0.36.
2 boxes seedless raisins at $0.10.

**Wednesday**

1 lb. coffee at $0.40.
2 green peppers at $0.05.
½ doz. lemons at $0.30.
5 lbs. rice at $0.05.
3 lbs. fancy prunes at $0.25.
½ lb. nutmeats at $0.50.

**Thursday**

3 heads celery ar $0.05.
½ lb. cheese at $0.30.
1 can tomato soup at $0.10.
2 10c packages spaghetti.
1½ doz. oranges at $0.40.
½ doz. grapefruit at 3 for 25c.

**3-6.** Find the amount of each day's purchase.

**7.** What is the total amount of her purchases?

**8.** Helen's mother used in making 5 lbs. of nut fudge:

4 lbs. sugar at $0.07 a lb.
1 cake chocolate at $0.18
½ lb. walnut meats at $0.50
⅛ lb. butter at $0.40 a lb.
1 quart milk at $0.06

**9.** What did the materials cost her?

**10.** What did the candy cost her per pound?

**Use local prices in vicinities where the above prices are not standard.**

## REVIEW PRACTICE PROBLEMS IN U. S. MONEY

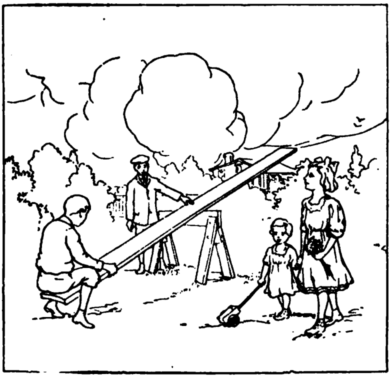
1. Our
2. United
3. States
4. Money
5. includes
6. cents,
7. nickels,
8. dimes,
9. quarters,
10. halves,
11. dollars,
12. ones,
13. twos,
14. fives,
15. tens,
16. twenties,
17. fifties,
18. hundreds,
19. gold,
20. silver,
21. paper,
22. alloy.

| | |
|---|---|
| A | $126.75 |
| C | 43.91 |
| D | 2.80 |
| E | 65.32 |
| F | 49.25 |
| G | 861.14 |
| H | 231.19 |
| I | 320.19 |
| K | 48.37 |
| L | 621.20 |
| M | 115.87 |
| N | 35.73 |
| O | 630.24 |
| P | 28.10 |
| Q | 263.15 |
| R | 530.12 |
| S | 91.14 |
| T | 440.16 |
| U | 72.19 |
| V | 82.11 |
| W | 27.36 |
| Y | 946.28 |

Beginning with the letters forming the first word, write successively the amount opposite the index letter and find the sum as illustrated below. Follow with the other words in like manner.

(O) $630.24
(U) 72.19
(R) 530.12
?

## DENOMINATE NUMBERS



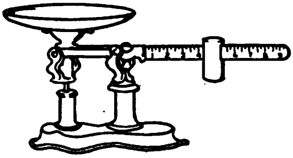
This is Roger sitting on the teeter. If Mary and Donald get on the other end, who will be up in the air? Why?

Which children in the picture look as if they would "balance" on the teeter, without moving up or down the board?

The pupils may compare the weight of different packages, by balancing them on a rude scales made of a stick suspended by a string tied halfway between the ends.

When your mother buys coffee at the grocery store she does not say, "I want a package of coffee as heavy as that other package." She says, "I will take — —— of coffee." How does the grocer know how much coffee is a pound?

There are many kinds of scales for weighing. Look for them in the drug store, the grocery and meat-market, at the coal and lumber yards. But they all go back to the simple idea of balancing the weight of 2 things.



You may have noticed the weight with which the druggist balances. With shot and bags or little boxes make some weights of your own. Try to make $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ lb. weights. In doing this you will learn:

1 lb. = 16 oz.

$\frac{1}{2}$ lb. = — oz.

$\frac{1}{4}$ lb. = — oz.

$\frac{1}{8}$ lb. = — oz.

How many of these can you work without a pencil?

**1.** Vera's mother made 3 gallons of apple butter which she put into pint jars. How many jars were needed?

**2.** She made 16 quarts of mustard pickles which were packed in ½ gallon crocks. How many crocks did the pickles fill.

**3.** For 2 gallons of strawberry sauce, she needed — quart fruit jars?

**4.** Vera's mother made 4 quarts of pineapple preserve. This filled — ½ pint bottles.

**5.** She canned 3 gallons of peaches. How many 2 quart jars did they fill?

**6.** What is the cost of 6 lbs. 8 oz. meat at $0.30 a pound?

**7.** Each of Jane's 2 pink hair-ribbons is 2 feet long and her sash is 5 feet in length. How many yards in her sash and hair-ribbons together?

**8.** John's garden plot is 3 yds. wide and 5 yds. long. How many yards of wire fencing are needed to go around it? How many feet?

**9.** Margaret uses 9 inches of satin ribbon in making 1 little sachet bag. How many bags can she make with 1 yard of ribbon? With 2 yards?

**10.** Henry's writing paper is ¾ foot wide. He wishes to arrange 4 columns of words on it. How many inches wide can each column be?

**11.** There are 365 days in a year. That is — weeks?

**12.** A "day" is — hours. A week is — hours.

### ORAL PRACTICE IN ADDITION AND SUBTRACTION

Without pencil give the sums, then differences.

| | | | | | |
|---|---|---|---|---|---|
| **1.** | **2.** | **3.** | **4.** | **5.** | **6.** |
| 13 | 41 | 43 | 52 | 33 | 40 |
| 24 | 68 | 75 | 87 | 46 | 59 |
| **7.** | **8.** | **9.** | **10.** | **11.** | **12.** |
| 85 | 53 | 49 | 76 | 164 | 159 |
| 60 | 42 | 20 | 42 | 34 | 20 |
| **13.** | **14.** | **15.** | **16.** | **17.** | **18.** |
| 179 | 235 | 368 | 172 | 291 | 284 |
| 10 | 104 | 11 | 21 | 100 | 13 |

Give such practice as this, often. Similar problems for drill may be written on the board.

### WRITTEN PRACTICE IN ADDITION AND SUBTRACTION

Find which you can do the more quickly, add or subtract in the following problems:

| | | | | |
|---|---|---|---|---|
| **1.** | **2.** | **3.** | **4.** | **5.** |
| 5214 | 8280 | 9461 | 8316 | 6490 |
| 3921 | 6135 | 3982 | 5219 | 5328 |
| **6.** | **7.** | **8.** | **9.** | **10.** |
| 8941 | 7296 | 9162 | 8269 | 7875 |
| 6287 | 5385 | 1387 | 7481 | 7689 |
| **11.** | **12.** | **13.** | **14.** | **15.** |
| 6435 | 9642 | 8436 | 6374 | 7458 |
| 2906 | 3471 | 2481 | 3291 | 3164 |

Exercises I, II and III, p. 256, may be used here for additional oral practice, by omitting the time-test.

## ORAL PRACTICE IN MULTIPLICATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 24 | 63 | 72 | 63 | 52 | 71 | 82 | 91 |
| 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 61 | 90 | 71 | 40 | 80 | 91 | 81 | 90 |
| 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| 321 | 420 | 734 | 132 | 423 | 522 |
| 2 | 2 | 2 | 3 | 3 | 4 |

## ORAL PRACTICE IN DIVISION

**1.** Read or write as rapidly as you can, the quotients of these numbers divided by 2; by 3; by 4; by 6:

)12 )48 )72 )36 )24
)60 )84 )96

**2.** Read or write as rapidly as you can the quotients of these numbers divided by 2; by 4; by 8:

)24 )40 )16 )48 )32
)72 )56 )80

**3.** Divide these numbers by 3; by 6; by 9:

)18 )54 )36 )72 )90

**4.** Without pencil, give quotients:

2)424 3)630 5)525 4)824 6)840
7)749 8)960 7)637 8)808 6)480
5)355 7)147 4)376 8)640 3)609
2)862 6)486 9)729 5)625 4)968
4)240 5)205 7)567 4)364 5)525
7)497 4)168 9)810 3)480 4)408

## SUGGESTIONS FOR BLACKBOARD REVIEW DRILLS

$$\left.\begin{array}{c}4\\3\\5\\2\\7\\6\\9\\8\\10\end{array}\right\}+2$$

1. A column of figures written on the board is a simple device for much valuable number drill. Time is saved by training the children to write without copying the column or taking their eyes from the board.

I. They may write the sum of these numbers and any other as 3, 9, 12, etc.

II. They may write the product of these numbers multiplied by 2, 3, 4, etc.

III. By writing appropriate numbers in the columns, any desired number may be subtracted.

IV. By having in the columns numbers divisible by a certain factor, this drill is adapted for division. If remainders are desired, divide the multiples of 9, for example by 8, 7, etc.

V. For study or home work, on one side of a folded sheet let each child have his own copy of the column with a corresponding list of answers on the other side. He can then drill himself.

2. The following which presents the more troublesome combinations in addition may be placed on the board in tabular form and used alternately with the above device for quick drill, not only in **addition,** but also with like advantage in **subtraction** and in **multiplication.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8<br>3 | 7<br>5 | 6<br>3 | 9<br>3 | 6<br>6 | 9<br>4 | 7<br>3 | 9<br>5 |
| 9<br>7 | 6<br>4 | 7<br>6 | 8<br>4 | 9<br>6 | 7<br>4 | 8<br>5 | 5<br>3 |
| 8<br>8 | 5<br>4 | 6<br>5 | 9<br>9 | 8<br>7 | 9<br>8 | 7<br>7 | 9<br>7 |

Add up. Add down. Subtract. Multiply.

1. Andrew was saving his money to buy these things:

| | | | |
|---|---|---|---|
| 1 pair roller-skates at | $1.19 | 1 Victor league baseball | $1.15 |
| 1 white ash baseball bat | .75 | 1 Fielder's glove | 1.50 |

How much money did he need?

2. When he had saved $2.25 how much had he yet to save?

3. The children in a certain school together bought a little menagerie, to use in their study of animals. They bought:

| | | | |
|---|---|---|---|
| 1 baby alligator at | $1.00 | 1 guinea pig at | $0.60 |
| 1 white rabbit at | .50 | 1 water snail at | .15 |
| 2 white mice, each | .25 | 2 goldfish, each | .10 |

How much did the zoo cost?

4. What did this food for the animals cost?

| | | | |
|---|---|---|---|
| 6 bunches of wilted carrots at | $0.03 | 1 piece raw meat at | $0.06 |
| 4 bunches of celery at | .02 | 1 head cabbage at | .05 |
| ½ doz. apples, "seconds," at | .12 | 1 small bag of grain at | .10 |
| 1 small bag of potatoes at | .10 | 1 box of fish food at | .15 |

5. These same children bought and raised bulbs. Each one chose what he wished from the selection. Their teacher sent in their combined order for:

| | | | |
|---|---|---|---|
| 150 Paper White Narcissi at | 2c | 36 White Hyacinths at | 6c |
| 25 Yellow Narcissi at | 3c | 124 Daffodils at | 3c |
| 42 Poet's Narcissi at | 1c | 75 Tulips at | 5c |
| 20 Blue Hyacinths at | 8c | 38 Snowdrops at | 2c |

Find the cost of their combined order.

6. Choose the bulbs you would like and find what they would cost at the above prices.

7. Find the cost of your school room supplies for 1 term.

## MISCELLANEOUS REVIEW PROBLEMS

See how many of these you can work without a pencil.

1. If four men invest $5,000 each in a mill, how much does the mill cost them?

2. A newsboy had twelve papers, got twelve more, and sold twenty-one. How many had he left?

3. A lady buys two tables, two book-cases, and six chairs. How many pieces of furniture does she buy?

4. A man bought twelve tons of coal, then three more, and used eleven tons. How many had he left?

5. A base-ball club won three games, and then two more, and then three more. How many games did it win in all?

6. A violin has four strings, a guitar has six strings and a mandolin has eight strings. How many strings do they have in all?

7. In 1789 there were only twelve States in the Union. There are now four times as many. How many States are there now?

8. If a man is charged $600.00 for an automobile and is allowed $69.60 for repairs made by him, what has the automobile cost him in cash?

9. A camping party of school boys have three tents, and for each tent there are sixteen tent pins to be driven into the ground. How many tent pins are there in all?

10. A clerk addressed ninty-seven envelopes to towns in Missouri (Mo.); but he wrote the *Mo.* so poorly that only sixty-three went to the right State, and the rest were sent to Maine (Me.). How many were missent?

# PART II

## A TRIAL LESSON

Copy, or write from dictation,[1] the following problems. If from dictation, leave room in which to put down the work. At the signal from your teacher begin working. She may wish to keep a record of your speed and accuracy to compare with your work on later tests of this kind.

Add:

**1.**

$$\begin{array}{r} 7\,2\,5\,4\,3\,6\,8 \\ 4\,0\,9\,7\,5\,3\,2 \\ 2\,8\,6\,4\,5\,9\,6 \\ 2\,4\,5\,6\,8\,7\,4 \\ 4\,1\,9\,2\,3\,0\,5 \\ \hline \end{array}$$

**2.**

$$\begin{array}{r} 7\,2\,3\,6\,1\,2\,6 \\ 5\,7\,9\,6\,4\,1\,5 \\ 2\,4\,1\,5\,6\,2\,3 \\ 3\,7\,5\,6\,1\,3\,5 \\ 2\,7\,5\,9\,6\,4\,2 \\ \hline \end{array}$$

Subtract:

**3.**

$$\begin{array}{r} 4\,7\,8\,9\,0\,6\,0\,4 \\ 1\,3\,5\,6\,7\,8\,1\,3 \\ \hline \end{array}$$

**4.**

$$\begin{array}{r} 8\,9\,8\,0\,6\,3\,9\,2 \\ 6\,2\,5\,9\,4\,2\,1\,6 \\ \hline \end{array}$$

Multiply:

**5.**

$$\begin{array}{r} 8\,7\,6\,5\,4\,0\,8 \\ 6 \\ \hline \end{array}$$

**6.**

$$\begin{array}{r} 4\,5\,9\,4\,8\,6\,2 \\ 7 \\ \hline \end{array}$$

Divide:

**7.** $9\overline{)\,9\,6\,0\,5\,4\,3\,3\,6}$

**8.** $5\overline{)\,4\,6\,0\,7\,8\,9\,2\,5}$

---

[1] Dictate as telephone numbers are given: "Seven, two, five," etc., in lines across the page, or in columns down. This avoids confusion since the children heretofore have not been reading or writing very large numbers.

You may expect the beginning fourth grade children to finish this test in about 5 minutes.

## READING AND WRITING NUMBERS

Of which do we make the more use, large or small numbers?

Can you name some things besides populations and crop reports which are stated in large numbers?

Read:

1. 1,000
2. 4,000
3. 5,000
4. 3,000
5. 7,000
6. 9,000
7. 14,000
8. 17,000
9. 12,000
10. 178,000
11. 321,000
12. 745,000

Write in figures:

1. 745 thousand
2. 326 thousand
3. 597 thousand
4. 649 thousand
5. 805 thousand
6. 720 thousand
7. Four hundred thirty-one thousand.
8. Seven hundred eighty-six thousand.
9. Five hundred thirty-two.
10. Five hundred thirty-two thousand.

What difference is there in the way you write them?

Read:

1. 436
2. 745
3. 876
4. 1,972
5. 4,564
6. 9,872
7. 18,654
8. 14,526
9. 18,309
10. 329,000
11. 329,652
12. 435,879

Write in figures:

1. 502 thousand, 786.
2. 326 thousand, 390.
3. Nine hundred eighty-four thousand, 603.

In writing the above numbers for what word do you not put any figures? How then, do you show it?

Read the following:

1. 2,340,580
2. 7,326,972
3. 4 568 320
4. 9 451,626
5. 6456178
6. 9874301
7. 7425978
8. 3254615

How did you think of the last 4 numbers in order to read them more easily?

At which end did you begin counting the groups?

How many places did you count for a complete group?

Point off into groups of three, from right to left and read:

1. 7304152
2. 8241670
3. 9064745
4. 8906324
5. 13040890
6. 43060042
7. 175421604
8. 376005026

The name of the first group beginning at the right is ones. The name of the second is —. The name of the third is —.

We rarely use numbers larger than hundreds of millions, but you might like to know that the next group to the left of millions is billions, then trillions.

Write from dictation:

1. 74306051
2. 408620546
3. 364578180
4. 260405002
5. 860050251
6. 300407801
7. 852436728
8. 961324507
9. 409009802

Read the numbers you have written.

Children often enjoy reading and writing large numbers as a sort of "stunt." So far as practical purposes are concerned the subject of "Notation and Numeration" may be passed over lightly.

### MULTIPLICATION BY ELEVEN

Find the following products:

$$\begin{array}{rrrrrr} 11 & 11 & 11 & 11 & 11 & 11 \\ \underline{\phantom{1}1} & \underline{\phantom{1}2} & \underline{\phantom{1}3} & \underline{\phantom{1}4} & \underline{\phantom{1}5} & \underline{\phantom{1}6} \end{array}$$

$$\begin{array}{rrrrr} 11 & 11 & 11 & 11 & 11 \\ \underline{\phantom{1}7} & \underline{\phantom{1}8} & \underline{\phantom{1}9} & \underline{10} & \underline{11} \end{array}$$

Write the products:

$1 \times 11 =$

$2 \times 11 =$

$3 \times 11 =$

$4 \times 11 =$

$5 \times 11 =$

$6 \times 11 =$

$7 \times 11 =$

$8 \times 11 =$

$9 \times 11 =$

$10 \times 11 =$

$11 \times 11 =$

Why is the table of 11's so easy to remember? Which is the only one you really have to learn?

**1.**

$$\begin{array}{r} 53642 \\ \underline{11} \\ 590062 \end{array}$$

**2.**

$$\begin{array}{r} 53642 \\ \underline{11} \\ 53642 \\ \underline{53642\phantom{0}} \\ 590062 \end{array}$$

**3.**

$$\begin{array}{r} 53642 \\ \underline{53642\phantom{0}} \\ 590062 \end{array}$$

In each of these problems 53,642 has been multiplied by what number? How was this done in the first? The second? The third?

Which do you find the easier, multiplying by eleven as shown in 1, or multiplying as in 2? 3 is a shorter form of the work than 2. What has been left out?

Multiplying large numbers by 11 as a one figure multiplier is usually a waste of time and effort. The aim in learning the table of 11's is increased efficiency in oral calculation. Encourage use of the third form in written work.

Using the shortest way, find the product of 11 times the following:

1. 43,621
2. 87,294
3. 75,964
4. 894,581
5. 329,623
6. 238,274
7. 367,213
8. 436,596
9. 459,782
10. 432,564
11. 826,274
12. 357,689

### Problems for Oral Solution.

As quickly as possible, without pencil supply the missing numbers:

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | ? | 5 | 11 | 20 | ? | 70 |
| 11 | 11 | 11 | ? | 11 | 11 | 11 |
| ? | 99 | ? | 110 | ? | 440 | ? |
| 24 | 32 | 41 | 60 | 34 | 23 | 90 |
| 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| ? | ? | ? | ? | ? | ? | ? |

**1.** Eleven cablegrams of 5 words each are how many words?

**2.** Eleven telegrams of 10 words each are how many words?

**3.** A room is rented for 11 dollars a month. What is the rent for a year?

**4.** In a class there are 11 boys, each 11 years old. What is the sum of their ages, told by multiplication?

**5.** If I send 11 packages by parcel post, and each package must have 4 two-cent stamps, what will the stamps cost me?

**6.** In a certain garden there are 11 strawberry plants in each row and there are 7 rows. How many strawberry plants are there in all?

## MULTIPLICATION BY 12

Find the following products:

$$\begin{array}{rrrrrr} 12 & 12 & 12 & 12 & 12 & 12 \\ \underline{1} & \underline{2} & \underline{3} & \underline{4} & \underline{5} & \underline{6} \end{array}$$

$$\begin{array}{rrrrrr} 12 & 12 & 12 & 12 & 12 & 12 \\ \underline{7} & \underline{8} & \underline{9} & \underline{10} & \underline{11} & \underline{12} \end{array}$$

Write the products:

1 × 12 =
2 × 12 =
3 × 12 =
4 × 12 =
5 × 12 =
6 × 12 =
7 × 12 =
8 × 12 =
9 × 12 =
10 × 12 =
11 × 12 =
12 × 12 =

Change the following to inches:

**1.** 1 ft. =
**2.** 7 ft. =
**3.** 11 ft. =
**4.** 8 ft. =
**5.** 6 ft. =
**6.** 10 ft. =
**7.** 4 ft. =
**8.** 3 ft. =
**9.** 2 ft. =
**10.** 5 ft. =
**11.** 12 ft. =
**12.** 9 ft. =

The following number of dozens are equal to how many things?

**1.** 1 doz. =
**2.** 8 doz. =
**3.** 10 doz. =
**4.** 5 doz. =
**5.** 3 doz. =
**6.** 4 doz. =
**7.** 6 doz. =
**8.** 2 doz. =
**9.** 9 doz. =
**10.** 7 doz. =
**11.** 12 doz. =
**12.** 11 doz. =

Change to months:

1 year; 2 yrs.; 5 yrs.; 7 yrs.; 9 yrs.; 3 yrs.; 4 yrs.; 6 yrs.; 8 yrs.; 12 yrs.; 10 yrs.; 11 yrs.

Try writing the table of 12's from memory. Note the ones you may not know, and study those especially.

Add by 12's from 0 to 144.

### PROBLEMS FOR ORAL SOLUTION

**1.** Five dozen eggs and 6 eggs more are — eggs?

**2.** How many lenses are there in 12 pairs of spectacles?

**3.** Twelve dozen things are a gross. A gross = — things?

**4.** How many citizens are there in 8 juries of 12 citizens each?

**5.** There are 4 dozen stars in our flag. These represent how many states?

**6.** At $10 a month what does Charles pay for the rent of his room for a year?

**7.** The ancient lyre had 7 strings. How many strings had 12 lyres? See picture p. 103.

**8.** In Mr. Jones' orchard there are 6 trees in each row. How many trees in 12 rows?

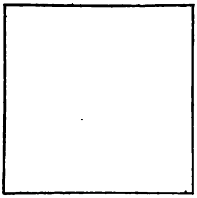
**9.** A clerk saves $12.00 a month from his salary. How much does he save in 11 months?

**10.** If I send 12 packages by parcel post and each package requires 6 two-cent stamps, how much money do I need for stamps?

Supply the missing numbers:

$$\begin{array}{r}12\\?\\\hline 60\end{array}\qquad\begin{array}{r}8\\12\\\hline ?\end{array}\qquad\begin{array}{r}?\\12\\\hline 72\end{array}\qquad\begin{array}{r}30\\12\\\hline ?\end{array}\qquad\begin{array}{r}20\\12\\\hline ?\end{array}\qquad\begin{array}{r}11\\12\\\hline ?\end{array}$$

$$\begin{array}{r}?\\12\\\hline 120\end{array}\qquad\begin{array}{r}?\\12\\\hline 48\end{array}\qquad\begin{array}{r}70\\12\\\hline ?\end{array}\qquad\begin{array}{r}?\\12\\\hline 108\end{array}\qquad\begin{array}{r}12\\?\\\hline 144\end{array}$$



## SQUARE MEASURE

1. How long is each side of this square?

2. This square is called a square inch. Why?

3. Out of cardboard, or fairly stiff paper, cut 24 inch-squares. How many inch squares do you use in making the following rectangles:[1]

4. 4 inches by 2 inches?
5. 8 inches by 3 inches?
6. 6 inches by 4 inches?
7. 7 inches by 3 inches?
8. 9 inches by 2 inches?
9. 12 inches by 2 inches?

10. One can always find how many square inches in a rectangle by building it with inch squares. But there is an easier way to tell. Have you found it?

1. How many different rectangles can you make, using 36 inch squares each time? Write the length and width of each rectangle you can make. Do not use the inch squares if you can get along without them.

Without building with the inch squares, tell how many square inches there are in each of the following rectangles:

1. 9″ by 4″
2. 8″ by 6″
3. 12″ by 6″
4. 8″ by 9″
5. 7″ by 5″
6. 8″ by 7″
7. 4″ by 8″
8. 9″ by 5″
9. 7″ by 12″
10. 12″ by 8″
11. 12″ by 11″
12. 9″ by 7″

---

[1] New terms are introduced without previous explanation on the supposition that a child who is thinking naturally demands an explanation of what he does not understand; and that such an explanation, given by his teacher, or a class-mate, to satisfy his curiosity makes more impression than one ready made to answer his question before he thinks enough to ask it. Very often, too, we assume children do not know things with which they are familiar, and "insult their intelligence" with tiresome explanations.

**1.** Find to the nearest foot, the length and width of your school room. Is it larger or smaller than a room 30 feet by 24 feet?[1]

**2.** Draw a foot square on the floor.

**3.** Letting $\frac{1}{4}$ inch represent a foot, draw a figure the same shape as your school room floor.

**4.** You can now mark your play floor off into rows $\frac{1}{4}''$ wide. These rows on the real floor are — wide.

**5.** Find how many foot squares there are in 1 row.

**6.** Without marking off the other rows can you tell how many square feet in the area of the entire floor?

**7.** How many square feet in the floor of the room 30 by 24 feet?

**8.** By how many square feet is your room larger or smaller?

Draw figures to represent the following, letting $\frac{1}{2}$ inch stand for a foot, and find the areas in square feet.

**1.** 12 feet by 16 feet =
**2.** 10 feet by 18 feet =
**3.** 10′ × 15′ =
**4.** 14′ × 12′ =

Tell the number of sq. feet in the following rectangles:

**1.** 9′ × 5′
**2.** 8′ × 9′
**3.** 11′ × 12′
**4.** 7′ × 9′
**5.** 10′ × 12′
**6.** 9′ × 6′
**7.** 5′ × 4′
**8.** 9′ × 12′

Explain as well as you can, how to find the area of a room.

The ability to find the area of a room is the best proof that a child understands the process. Do not expect too careful explanations.

---

[1] The answering of this question brings out two facts: 1. in order to tell their exact difference in size, the areas of the two rooms must be found; 2. a larger unit than the square inch, namely the square foot, is used to express the area.

## SQUARE MEASURE

Many people do not have enough sunlight in their houses. If you were to take the windows from a properly lighted room and lay them on the floor, they would cover at least $\frac{1}{5}$ of it.

**1.** A room whose floor area is 120 sq. feet should have how many sq. feet of windows to be properly lighted?

**2.** One with a floor area of 140 sq. feet needs — sq. feet of windows?

**3.** The area of a school room 30′x20′ is — sq. feet?

**4.** To be properly lighted, it should have at least — sq. feet of windows?

**5.** This school room contains 6 windows. Each one is — feet wide and — feet high. Each window contains — sq. feet.

**6.** The 6 windows together contain — sq. feet?

**7.** Does this school room have more or less window space than the required amount? How many sq. feet?

**8.** You have already found the area of your own school room (Ex. 7, P. 159). How many sq. feet of window space should it have to be properly lighted?

**9.** With your teacher's help, find out as nearly as you can, the amount of window space in your room. How does it compare with the required number of square feet?[1]

The value of sunshine and fresh air is a topic commonly given in the fourth or preceding grades. Such problems as these reinforce this instruction.

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[1] Do not attempt more than approximate measurements.

Why should people screen their houses?

Ordinarily screen netting is sold by the square foot. Carpenters buy it in 100 foot rolls at 2¼ cents a square foot.

**1.** How many square feet of netting are needed for a door 7 feet by 3 feet? Not allowing any for waste.

**2.** A window has an upper and a lower pane, each 3 feet by 2½ feet. How many square feet are needed for each pane?

**3.** How many square feet of netting are needed for 1 window?

Poultry netting is also sold by the square foot. This may be bought in widths from 1½ to 8 feet.

**4.** John needs a strip of netting 2 feet wide and 24 feet long to put around his rabbit pen. How many square feet does he need?

**5.** Phillip had the pen for his older chickens fenced in with netting 8 feet high. It took a strip 72 feet long to go around. How many square feet of netting were there in his fence?

**6.** The pen for the smaller chickens was inclosed with a strip of netting 3 feet wide and 36 feet long. How many sq. feet of netting were needed?

**7.** A sweet pea trellis 3 feet wide and 24 feet long contains — sq. feet of netting?

**8.** A morning glory trellis 8 feet high and 12 feet long contains — sq. feet of netting?

**9.** What does it cost at $0.02 a square foot?

**10.** Does it cost more or less than the sweet-pea trellis, and how much?

### ORAL TIME DRILL FOR BLACKBOARD AND DESK

| A | VIII | IX | X | XI | XII | XIII | XIV | D |
|---|---|---|---|---|---|---|---|---|
| VII | 3 | 5 | 4 | 1 | 6 | 7 | 2 | |
| VI | 6 | 7 | 8 | 6 | 5 | 3 | 7 | |
| V | 4 | 1 | 2 | 7 | 4 | 9 | 3 | |
| IV | 7 | 8 | 9 | 5 | 6 | 4 | 8 | |
| III | 2 | 3 | 7 | 3 | 9 | 5 | 2 | |
| II | 8 | 6 | 9 | 1 | 6 | 8 | 1 | |
| I | 4 | 2 | 5 | 9 | 8 | 3 | 9 | |
| C | | | | | | | | B |

A recitation is not properly begun without a few minutes of quick drill work. Timing each pupil and **keeping his record** motivates such work.

1. Add rows I to VII from left to right.
2. Add rows I to VII from right to left.
3. Add columns VIII to XIV from top to bottom.
4. Add columns VIII to XIV from bottom to top.

By the use of a pointer to trace the line the combinations on the diagonal lines may also be utilized.

A blackboard copy of this drill permits changing the order of the figures from time to time thereby **insuring that the children are not learning the answers from their position in the diagram.** The drill may be oral or written.

### REVIEW PRACTICE PROBLEMS

Perform the following additions:[1]

| | | |
|---|---|---|
| **1.** $132.65 | **2.** $516.93 | **3.** $7,560.45 |
| 49.32 | 373.22 | 711.55 |
| 423.58 | 37.19 | 3,161.37 |
| 191.45 | 118.61 | 1,298.40 |
| 382.73 | 925.86 | 5,117.30 |
| 77.42 | 315.24 | 2,438.63 |

Perform the following subtractions:

| | | |
|---|---|---|
| **1.** $132.65 | **4.** $516.93 | **7.** $1,560.45 |
| 49.32 | 373.22 | 711.55 |
| **2.** $423.58 | **5.** $ 37.19 | **8.** $3,161.37 |
| 91.45 | 8.61 | 1,298.40 |
| **3.** $382.73 | **6.** $925.86 | **9.** $5,117.30 |
| 77.42 | 315.24 | 2,438.63 |

Multiply the following amounts by 8, by 12, and by 43:

| | | |
|---|---|---|
| **1.** $132.65 | **4.** $516.93 | **7.** $1,560.45 |
| **2.** 49.32 | **5.** 373.22 | **8.** 711.55 |
| **3.** 423.58 | **6.** 37.19 | **9.** 3,161.37 |

Multiply the following amounts by 9, by 37, and by 65:

| | | |
|---|---|---|
| **1.** $191.45 | **3.** $118.61 | **5.** $1,298.40 |
| **2.** 382.73 | **4.** 925.86 | **6.** 5,117.30 |

---

[1] In these and in all subsequent additions, the pupils should be encouraged to combine mentally two or more figures as one number, where it may be easily done, as in the first column of the first example: (2 and 3) 5+5=10. 10+ (8 and 2) 10=20. 20+5=25. Pupils should not *think* the words "plus," "are," or "equals" but simply pronounce mentally the successive values as 5, 10, 20, 25. *Addition in arithmetic is adding without counting.*

## MAKING CHANGE

If you should purchase the following articles and should hand the storekeeper $1.00 in payment each time, what amount of change would you receive? Make the solutions mentally when you can.

1. Fourth Reader, 40 cents.
2. Pocket knife, 85 cents.
3. Fish hooks, rod and line, 65 cents.
4. Pair of skates, 95 cents.
5. 3 dozen oranges, at 30 cents per dozen.
6. 2 pounds of candy, at 30 cents per pound.

Paying for each of the following purchases with a two-dollar bill, you will receive what amount in change?

1. 3 dozen bananas, at 20 cents per dozen.
2. 6 yards of ribbon, at 27 cents per yard.
3. 10 pounds of sugar, at 6 cents per pound.
4. $2\frac{1}{2}$ dozen lemons, at 30 cents per dozen.
5. 3 pounds of cheese, at 28 cents per pound.
6. 2 napkin rings, at 95 cents each.

Paying for each of the following purchases with a five-dollar bill, you will receive what amount in change?

1. Student lamp, $3.60. 2. Rocking chair, $4.25.

In ordinary business transactions what is called the "Austrian Method" is usually employed in making change; i. e., adding to the purchase price until the amount tendered in payment is reached, instead of finding the difference between the two amounts. For example in problem 1 the storekeeper would say, "40, 50, $1.00," in problem 2, "85, 90, $1.00," in problem 3, "65, 75, $1.00," etc., always first pronouncing the amount of the purchase and then, in order, the amount of the change as it is laid down for the purchaser. In playing store, pupils should be taught to use this method.

## MAKING CHANGE

If you should sell the following articles and receive in payment two one-dollar bills in each case, what amount of change should you give to the purchaser? Who bears the greater responsibility for correctness in making change—the buyer or the seller?

1. 1 gallon of maple syrup at $1.20.
2. 2 bushels of seed corn at 84 cents per bushel.
3. ½ dozen watermelons at 32 cents each.
4. 1 barrel of apples, $1.62.
5. 3 bushels of pears at 55 cents per bushel.
6. 2 bushels of potatoes at 60 cents per bushel.

Or if you were a salesman in a general store, what change would you have to give to the purchaser of the following articles, if the amount of money handed to you in each case should be three dollars?

1. ½ dozen tablespoons, at $5.00 per dozen.
2. 2 yards of silk, at $1.25 per yard.
3. 1 flower vase, $2.60.
4. 2 candlesticks, at $1.20 each.
5. ½ dozen plated knives, at $5.50 per dozen.
6. 16 yards of calico at 15 cents per yard.

On the following purchases, what change would be required if the payment in each case should be made with a five-dollar bill?

1. 2½ kegs ten penny nails at $1.80 per keg.
2. 1 metal water cooler, $4.10.
3. ½ doz. Victrola records, at 75 cents each.
4. 1 ten-inch globe, $3.50.
5. 1 United States flag, $4.90.
6. 1 croquet set, $3.25.
7. 1 pair ball bearing roller skates, $1.45.

### REVIEW PRACTICE PROBLEMS

Find the sums of the following numbers in the easiest way:

**1.**
4
44
444
4444
44444

**2.**
5
55
555
5555
55555

**3.**
6
66
666
6666
66666

**4.**
7
77
777
7777
77777

**5.**
8
88
888
8888
88888

**6.**
9
99
999
9999
99999

**7.**
1234
4321

**8.**
12345
54321

**9.**
123456
654321

**10.**
1234567
7654321

**11.**
12345678
87654321

**12.**
123456789
987654321

Perform the subtractions indicated:

**1.** 47 − 32
**2.** 371 − 219
**3.** 8642 − 7146
**4.** 32964 − 22436
**5.** 716391 − 597634
**6.** 5496812 − 3796124
**7.** 23769851 − 17469587
**8.** 83 − 65
**9.** 496 − 379
**10.** 5427 − 4685
**11.** 72150 − 62564
**12.** 64913 − 572135
**13.** 7396205 − 6389456
**14.** 83285972 − 79863299

Multiply each of the following numbers by 7, by 25, and by 38.

| **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|
| 474 | 592 | 5,614 | 21,667 | 329,684 |

## REVIEW PROBLEMS IN SHORT DIVISION

Divide by 5:

1. 725 3. 615 5. 415 7. 810 9. 705
2. 830 4. 710 6. 795 8. 625 10. 930

Divide by 9:

1. 387 3. 648 5. 873 7. 486 9. 963
2. 477 4. 711 6. 522 8. 648 10. 801

Divide by 4:

1. 364 3. 712 5. 692 7. 512 9. 412
2. 728 4. 416 6. 848 8. 616 10. 932

Divide by 6:

1. 7230 3. 4212 5. 7248 7. 7836 9. 6353
2. 5436 4. 3720 6. 6309 8. 1580 10. 8355

Divide by 3:

1. 2718 3. 4920 5. 7323 7. 3822 9. 4819
2. 5262 4. 8532 6. 5712 8. 9318 10. 6155

Divide by 8:

1. 1632 3. 5864 5. 4832 7. 8256 9. 5529
2. 7656 4. 6456 6. 9136 8. 7496 10. 7236

Divide by 7:

1. 708106 3. 511084 5. 425360 7. 392084
2. 630826 4. 966097 6. 820470 8. 714707

Divide by 2:

1. 861548 3. 780632 5. 921354 7. 520672
2. 531604 4. 614098 6. 370968 8. 741798

Divide by 9:

1. 891630 3. 486081 5. 723402 7. 542718
2. 236745 4. 630954 6. 349209 8. 845136

### DIVIDING BY 10

Copy these problems filling in the answers:

**1.** 90 ÷ 10 **2.** 20 ÷ 10 **3.** 50 ÷ 10 **4.** 80 ÷ 10

**5.** 10)270

**6.** 10)450

**7.** 10)800

**8.** 10)2730

In each case compare the quotient with the dividend.

Can you tell an easy way to divide numbers ending in zero, by 10? Without using your pencil divide the following numbers by 10:

**1.** 620
**2.** 100
**3.** 370
**4.** 480
**5.** 700
**6.** 1240
**7.** 3060
**8.** 4000
**9.** 1060
**10.** 8540
**11.** 1390
**12.** 5030
**13.** 3600
**14.** 5090
**15.** 4900
**16.** 90,000
**17.** 62,400
**18.** 40,080
**19.** 10,960
**20.** 75,020

Copy these problems filling in the answers:

**1.** 10)294

**2.** 10)362

**3.** 10)178

**4.** 10)95

**5.** 10)86

**6.** 10)104

**7.** 10)78

**8.** 10)621

How are the dividends in these problems different from those in the first 8 problems on this page?

Compare the quotient with the dividend in each case.

Which digit tells you the number of tenths remaining?

Without using your pencil, divide the following numbers by 10.

**1.** 28
**2.** 72
**3.** 56
**4.** 45
**5.** 36
**6.** 89
**7.** 75
**8.** 41
**9.** 74
**10.** 55
**11.** 126
**12.** 341
**13.** 509
**14.** 712
**15.** 607
**16.** 1026
**17.** 3005
**18.** 4027
**19.** 5004
**20.** 9862

### DIVIDING BY MULTIPLES OF TEN.

Solve orally and compare the quotients:

**1.** $4 \div 2 = ?$ $40 \div 20 = ?$
**2.** $6 \div 3 = ?$ $60 \div 30 = ?$
**3.** $10 \div 5 = ?$ $100 \div 50 = ?$
**4.** $2 \div 1 = ?$ $20 \div 10 = ?$
**5.** $15 \div 5 = ?$ $150 \div 50 = ?$
**6.** $12 \div 2 = ?$ $120 \div 20 = ?$
**7.** $16 \div 8 = ?$ $160 \div 80 = ?$
**8.** $24 \div 6 = ?$ $240 \div 60 = ?$
**9.** $36 \div 9 = ?$ $360 \div 90 = ?$
**10.** $27 \div 3 = ?$ $270 \div 30 = ?$

### DIVIDING BY MULTIPLES OF 10

Solve orally:

**1.** $270 \div 90 = ?$
**2.** $300 \div 50 = ?$
**3.** $480 \div 60 = ?$
**4.** $360 \div 40 = ?$
**5.** $450 \div 90 = ?$
**6.** $250 \div 50 = ?$
**7.** $120 \div 30 = ?$
**8.** $630 \div 90 = ?$
**9.** $360 \div 30 = ?$
**10.** $160 \div 20 = ?$
**11.** $480 \div 30 = ?$
**12.** $320 \div 40 = ?$
**13.** $180 \div 60 = ?$
**14.** $720 \div 90 = ?$
**15.** $490 \div 70 = ?$

By what did you first divide both dividend and divisor to make your work easier?

This division by 10 is shown in a written problem so:

$$\begin{array}{r} 2\cancel{0})\underline{158\cancel{0}} \\ 84 \end{array}$$

Perform the following by short division:

**1.** $60)\underline{4860}$
**2.** $30)\underline{2790}$
**3.** $50)\underline{2500}$
**4.** $90)\underline{8190}$
**5.** $80)\underline{7280}$
**6.** $20)\underline{6480}$
**7.** $70)\underline{5670}$
**8.** $40)\underline{4880}$
**9.** $30)\underline{3690}$
**10.** $50)\underline{6150}$
**11.** $90)\underline{2880}$
**12.** $60)\underline{1440}$
**13.** $50)\underline{3150}$
**14.** $80)\underline{4720}$
**15.** $40)\underline{2760}$
**16.** $30)\underline{4110}$

You can use this short cut also when the divisor only ends in 0.

### DIVIDING BY MULTIPLES OF TEN

What do you notice in the following problems:

**1.** $2\cancel{0})\underline{86\cancel{4}}$ $43\frac{4}{20}$

**2.** $4\cancel{0})\underline{72\cancel{3}}$ $18\frac{3}{40}$

**3.** $3\cancel{0})\underline{72\cancel{7}}$ $24\frac{7}{30}$

**4.** $6\cancel{0})\underline{24\cancel{5}}$ $4\frac{5}{60}$

In the same way work the following:

**1.** $30)\underline{242}$

**2.** $70)\underline{356}$

**3.** $20)\underline{4863}$

**4.** $80)\underline{647}$

**5.** $50)\underline{2504}$

**6.** $60)\underline{369}$

**7.** $40)\underline{2483}$

**8.** $90)\underline{726}$

In the following problems the part of the dividend not marked off is not exactly divisible by the divisor, as in the preceding. Show that the number of tens remaining is added to the remainder already indicated, so:

$$4\cancel{0})\underline{197\cancel{5}}$$
$$49\tfrac{15}{40}$$

**9.** $20)\underline{2432}$

**10.** $30)\underline{6245}$

**11.** $60)\underline{3713}$

**12.** $40)\underline{3223}$

**13.** $50)\underline{2567}$

**14.** $90)\underline{4325}$

**15.** $40)\underline{6731}$

**16.** $80)\underline{5723}$

**17.** $60)\underline{7275}$

**18.** $30)\underline{6762}$

**19.** $50)\underline{6525}$

**20.** $20)\underline{7332}$

**21.** $70)\underline{8555}$

**22.** $80)\underline{9778}$

**23.** $60)\underline{8235}$

**24.** $90)\underline{3795}$

Keep in mind the relation this bears to long division; *it is the way whereby the trial quotient is found; i. e.*, thinking of the divisor as the nearest exact number of tens.

### LONG DIVISION

1. $$\begin{array}{r} 729 \\ 8\overline{)5832} \end{array}$$

2. $$\begin{array}{r} 729 \\ 8\overline{)5832} \\ \underline{56}\phantom{00} \\ 23\phantom{0} \\ \underline{16}\phantom{0} \\ 72 \\ \underline{72} \end{array}$$

In dividing 5832 by 8, if you were to write all you do, instead of working a part orally, the problem would look like 2 instead of 1.[1] We call this second form, Long Division. Work the following problems both ways.

1. 1728 ÷ 6　　3. 1089 ÷ 11　　5. 432 ÷ 12
2. 625 ÷ 5　　4. 616 ÷ 11　　6. 1068 ÷ 12

Which way do you find the easier for the last four problems?

Which way would you use to divide 1575 by 21. Why?

Divide the following numbers by 21.

1. 861　　2. 756　　3. 672　　4. 525　　5. 1176

Divide by 31.

1. 672　　2. 837　　3. 1054　　4. 1333　　5. 1612

---

[1] This comparison with the short division process already familiar to the children is a natural way in which to approach long division. The comparison should be carried out with enough care to insure the children's seeing, for example, in the problem 5832 ÷ 8 that the 2 in the first remainder of the long form, represents the 2 remaining in the short division problem; and that the 3 is "brought down" in order to be annexed to the remainder just as the 3 and remainder are annexed mentally in the short form.

The children can show their understanding without lengthy explanations. A detailed analysis of the process of long division for the pupils enlightenment is purposely omitted, since this is a subject which should be carefully presented by the teacher.

### DRILL PROBLEMS WITH TWO-FIGURE DIVISOR

Find the quotients:

1. There are — ounces in a pound. 384 ounces are — pounds?

2. In a year there are 365 days. This is an average of how many a month?

3. A 42 acre fruit farm is valued at $9450. What is the price per acre?

4. 636 ounces are how many pounds?

5. A yard is — inches. 900 inches are — yards?

Make the following divisions:

**1.** 3458 ÷ 91
**2.** 2623 ÷ 61
**3.** 2208 ÷ 81
**4.** 2080 ÷ 32
**5.** 3066 ÷ 42
**6.** 5270 ÷ 62
**7.** 6150 ÷ 82
**8.** 2046 ÷ 22
**9.** 4324 ÷ 72
**10.** 4368 ÷ 52
**11.** 4266 ÷ 79
**12.** 4292 ÷ 59
**13.** 3198 ÷ 39
**14.** 4424 ÷ 79
**15.** 4183 ÷ 89
**16.** 3038 ÷ 49
**17.** 2407 ÷ 29
**18.** 3588 ÷ 69
**19.** 4189 ÷ 59
**20.** 3627 ÷ 39
**21.** 3213 ÷ 51
**22.** 2848 ÷ 89
**23.** 1794 ÷ 39
**24.** 4554 ÷ 69
**25.** 5893 ÷ 71
**26.** 3977 ÷ 41
**27.** 1769 ÷ 29
**28.** 5185 ÷ 61
**29.** 4116 ÷ 49
**30.** 6674 ÷ 71

Pay especial attention to *finding the quotient by inspection.* For example, to divide 3458 by 91 *think, "9 in 34"*, remembering that 3 times 91 is slightly more than 3 times 90. Or to divide 4266 by 79, *think "8 in 42,"* remembering that 5 times 79 is somewhat less than 5 times 80. Divisors within 2 of the even tens such as 78, 79, 81, 82, may usually be compared with the nearest even number of tens. Divisors such as 64, 65, 66, 67, require more careful study to determine the quotient, because of the greater number of units which must also be multiplied. Such problems in division call for *judgment.* This ability to judge must be developed by careful teaching or much time will be wasted by the children in guessing at quotients.

$$\begin{array}{r} 38 \\ 91\overline{)3458} \\ \underline{273\phantom{8}} \\ 728 \\ \underline{\underline{728}} \end{array}$$

## PRACTICE PROBLEMS IN LONG DIVISION

**1.** Ruth's class went on a picnic. The children together planned a lunch which cost $3.15. There were 21 children to pay this. What was each one's share?

**2.** Plan a lunch you would like if your class were going on a picnic. Find how much it costs each one of you.

**3.** Raymond joined a Savings Club in which, by making weekly payments, he received $61.80 at the end of a year. This was an average saving of how much per month?

**4.** During one month in a certain room of 38 pupils there were in all 760 checks for misspelled words on four twenty-five word spelling tests. This was, on the average, how many words misspelled by each pupil? Is this better spelling than you do, or not so good?

**5.** In a school month of 19 days, a fourth grade class had 76 new and 114 review words in spelling. They had how many words each day? Do you have more or fewer words than these?

**6.** A sixth grade in the same time had 114 new words and 190 in review. How many words did they have each day?

**7.** The children in a certain city volunteered to raise $1000 to be spent in buying lantern slides and other equipment for use in the schools. If this amount was equally divided among 25 schools, what was the number of dollars to be raised by each school?

### DRILL PROBLEMS WITH A TWO-FIGURE DIVISOR

Divide the following, and give the remainders,[1] if any:

1. 1740 ÷ 32
2. 2019 ÷ 53
3. 2376 ÷ 33
4. 2968 ÷ 63
5. 3526 ÷ 43
6. 2738 ÷ 78
7. 5016 ÷ 88
8. 1588 ÷ 28
9. 3234 ÷ 98
10. 5041 ÷ 78
11. 23236 ÷ 74
12. 27328 ÷ 64
13. 27412 ÷ 44
14. 28050 ÷ 34
15. 22464 ÷ 24
16. 64218 ÷ 77
17. 44745 ÷ 57
18. 25164 ÷ 27
19. 30315 ÷ 47
20. 31598 ÷ 37
21. 22828 ÷ 62
22. 25108 ÷ 36
23. 42872 ÷ 46
24. 57325 ÷ 76
25. 38872 ÷ 86
26. 36925 ÷ 65
27. 37935 ÷ 45
28. 24067 ÷ 25
29. 23870 ÷ 35
30. 26107 ÷ 55

### PROBLEMS INVOLVING A THREE-FIGURE DIVISOR

1. In a certain city there are 8400 school children enrolled. There are 240 teachers in this city's schools. Each teacher averages how many pupils? Is this more or fewer pupils than your teacher has?

2. Can you tell a way to shorten the work of dividing 8400 by 240?

Show how to shorten the work in making the following divisions:

3. 810 ÷ 270
4. 1780 ÷ 890
5. 1240 ÷ 310
6. 2300 ÷ 460
7. 3180 ÷ 530
8. 2380 ÷ 340
9. 2080 ÷ 260
10. 1700 ÷ 170
11. 4320 ÷ 540
12. 8700 ÷ 870
13. 5850 ÷ 650
14. 4600 ÷ 920

---

[1] Show that the remainder in long division is written just as in the short form. See page 134. Reduction of the remainders is not expected in 4th grade.

$$\begin{array}{r} 54\tfrac{12}{32} \\ 32\overline{)1740} \\ \underline{160\phantom{0}} \\ 140 \\ \underline{128} \\ 12 \end{array}$$

By oral problems lead the children to see the way to prove division: that the product of the divisor and the quotient plus the remainder, if there is any, equals the dividend.

### DRILL PROBLEMS WITH A THREE-FIGURE DIVISOR

1. All the children in a certain new school, who could, brought pennies once a week with which to buy some good pictures for their building. During the first year $104.80 was raised in this manner. With 524 children in the school, this was how much for each child?[1]

Find the quotients:

2. 32103 ÷ 261
3. 99672 ÷ 426
4. 68418 ÷ 543
5. 93870 ÷ 298
6. 72688 ÷ 472
7. 74151 ÷ 231
8. 201825 ÷ 621
9. 125195 ÷ 365
10. 108712 ÷ 428
11. 143880 ÷ 872
12. 325248 ÷ 924
13. 110744 ÷ 436
14. 250992 ÷ 581
15. 125255 ÷ 235
16. 111338 ÷ 179
17. 282632 ÷ 824
18. 350880 ÷ 645
19. 221791 ÷ 863

Divide the following:[2]

1. 85425 ÷ 425
2. 74292 ÷ 246
3. 75190 ÷ 365
4. 88182 ÷ 426
5. 97020 ÷ 315
6. 95580 ÷ 236
7. 91778 ÷ 842
8. 228734 ÷ 562
9. 315884 ÷ 628
10. 329536 ÷ 542
11. 298979 ÷ 731
12. 580215 ÷ 823
13. 119392 ÷ 574
14. 106128 ÷ 264
15. 248056 ÷ 614
16. 422838 ÷ 834
17. 292128 ÷ 716
18. 373902 ÷ 617
19. 642330 ÷ 915
20. 144179 ÷ 479
21. 315381 ÷ 627

---

[1] The problems on this page require division with a three-figure divisor. As before, stress finding each figure of the quotient without a pencil in so far as it is practical. For example, in the first problem, show that *the 5 is the important part of the divisor*, because it constitutes the largest part, 500, that the tens must also be considered, while as a rule, the units are negligible in determining the trial quotient.

[2] These problems involve the troublesome 0 in the quotient. Since there is an inclination occasionally to skip a quotient figure where the first partial dividend is found insufficient and another figure must be brought down, this type of problem is one on which special drill should be given.

$$\begin{array}{r} 407 \\ 562\overline{)228734} \\ \underline{2248\phantom{34}} \\ 3934 \\ \underline{3934} \end{array}$$

## MULTIPLYING BY A MIXED NUMBER

**1.** What is the cost of 3 pounds of candy at $0.30 a pound?

**2.** What does $\frac{1}{2}$ pound cost at this price?

**3.** How can you find what $3\frac{1}{2}$ pounds cost?

**4.** What is the cost of 2 dozen bananas at $0.20 a dozen?

**5.** What do $\frac{3}{4}$ of a dozen cost?

**6.** How do you find the cost of $2\frac{3}{4}$ dozen?

**7.** Find the cost of $4\frac{1}{2}$ pounds of meat at $0.26 a pound. How will you do this problem?

The work may be put down so:

$$\begin{array}{r} \$0.26 \\ 4\frac{1}{2} \\ \hline \$1.04 \\ .13 \\ \hline ? \end{array} \qquad \text{or} \qquad \begin{array}{r} \$0.26 \\ 4\frac{1}{2} \\ \hline \$0.13 \\ 1.04 \\ \hline ? \end{array}$$

What difference is there in the two ways?

**8.** Find the cost of $8\frac{1}{2}$ yards of ribbon at $0.42 a yard?

**9.** What is the cost of $2\frac{3}{4}$ tons of hard coal at $8.20 a ton?

$$\begin{array}{r} \$8.20 \\ 2\frac{3}{4} \\ \hline ?\ ?? \\ ?\ ?? \\ \hline .?? \end{array} \qquad\qquad \begin{array}{r} 4\overline{)\$8.20} \\ ?\ ?? \\ \times\ \ 3 \\ \hline ?\ ?? \end{array}$$

**10.** Find the cost of $4\frac{3}{5}$ tons of soft coal at $4.25 a ton.

| | | | |
|---|---|---|---|
| **11.** 729<br>$6\frac{2}{9}$ | **12.** 625<br>$8\frac{3}{5}$ | **13.** 343<br>$9\frac{5}{7}$ | **14.** 843<br>$5\frac{2}{3}$ |
| **15.** 364<br>$26\frac{1}{2}$ | **16.** 752<br>$35\frac{1}{4}$ | **17.** 985<br>$72\frac{3}{5}$ | **18.** 408<br>$65\frac{3}{4}$ |
| **19.** 585<br>$15\frac{2}{5}$ | **20.** 783<br>$21\frac{2}{3}$ | **21.** 472<br>$32\frac{3}{4}$ | **22.** 648<br>$27\frac{3}{8}$ |

Find the product of the following:

**1.** Find the cost of 8 yards of gingham at \$0.12$\frac{1}{2}$ a yard.

Work \$0.12$\frac{1}{2}$
8
.04
.96
\$? ??

In finding 8 × $\frac{1}{2}$¢ think: $\frac{1}{2}$ of 8¢

**2.** What is the cost of 6 yards at the same price?

| | | | |
|---|---|---|---|
| **3.** $245\frac{1}{2}$<br>8 | **4.** $562\frac{1}{2}$<br>6 | **5.** $325\frac{3}{4}$<br>8 | **6.** $725\frac{2}{3}$<br>15 |
| **7.** $648\frac{3}{8}$<br>24 | **8.** $725\frac{5}{6}$<br>36 | **9.** $674\frac{3}{4}$<br>72 | **10.** $426\frac{2}{3}$<br>48 |
| **11.** $547\frac{1}{9}$<br>45 | **12.** $683\frac{3}{8}$<br>48 | **13.** $792\frac{2}{5}$<br>35 | **14.** $847\frac{1}{6}$<br>42 |
| **15.** $465\frac{1}{6}$<br>72 | **16.** $843\frac{2}{7}$<br>42 | **17.** $634\frac{3}{8}$<br>32 | **18.** $592\frac{2}{9}$<br>45 |

**19.** What is the product of $872\frac{3}{8}$ × 48?

**20.** Find the cost of $86\frac{3}{4}$ doz. eggs @ \$0.27.

For further problems of this kind, see page 245.

## DRILLS FOR SPEED AND ACCURACY

To the Teacher: Most of the work pricr to this stage has dealt with mastering the fundamental facts and learning how to use them in the four operations. We should now begin *systematic work* for the development of *speed* as well as accuracy in the use of these operations.

On pp. 255-270 there are given 45 standardized exercises for practice which not only provide *constant review* on the essentials, but form a *reliable test* of the pupils' ability and progress.

The abstract review tables, given below, and on pages 192, 200, 212, 218 and 225 are based on the more concentrated practice exercises, as you will find indicated. They furnish a basis for *daily work* leading up to the Test Drills. You should devote some time *each day* to this work, even if at first you may seem to sacrifice some other phases of the arithmetic.

A systematic record of individual and class progress is most desirable. A daily record perhaps is impractical, but a showing of each one's standing on the Test Drills is a great incentive.

### I. Addition

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9<br>3 | 3<br>2 | 5<br>7 | 6<br>3 | 3<br>3 | 2<br>1 | 6<br>6 | 3<br>8 | 9<br>2 |
| 8<br>1 | 3<br>7 | 14<br>3 | 5<br>9 | 11<br>5 | 14<br>2 | 1<br>4 | 4<br>7 | 9<br>7 |
| 11<br>9 | 4<br>8 | 16<br>4 | 9<br>4 | 13<br>2 | 2<br>4 | 6<br>9 | 5<br>4 | 13<br>5 |
| 9<br>9 | 5<br>6 | 2<br>6 | 11<br>2 | 8<br>5 | 12<br>5 | 9<br>6 | 8<br>7 | 14<br>8 |
| 6<br>7 | 13<br>7 | 7<br>7 | 9<br>1 | 14<br>6 | 10<br>7 | 7<br>1 | 7<br>2 | 8<br>9 |
| 10<br>5 | 3<br>6 | 2<br>9 | 5<br>8 | 6<br>5 | 4<br>9 | 7<br>6 | 9<br>8 | 10<br>6 |
| 10<br>4 | 12<br>4 | 13<br>3 | 15<br>5 | 7<br>5 | 11<br>3 | 17<br>3 | 18<br>2 | 12<br>8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 15 | 15 | 2 | 7 | 6 | 15 | 10 | 18 | 10 |
| 9 | 7 | 8 | 8 | 4 | 2 | 1 | 1 | 9 |
| 2 | 10 | 8 | 8 | 12 | 3 | 3 | 5 | 13 |
| 5 | 3 | 6 | 4 | 3 | 4 | 5 | 1 | 9 |
| 4 | 12 | 10 | 16 | 12 | 7 | 11 | 10 | 16 |
| 6 | 1 | 2 | 6 | 6 | 9 | 7 | 8 | 8 |

## SUGGESTIONS FOR USING THE REVIEW OF ADDITION FACTS

### I

1. Let each one in the class write in order the answers, without copying the examples.

2. When the answers are read, check the ones that are wrong.

3. Correct and study especially the ones you missed, that you may get them right the next time.

### II

Those who first write all the answers correctly, may work for increased speed. Try some of the following:

1. Find which one can read, in the least time, the answers in a given number of rows; then, which one can give all the answers in the least time.

2. Copy these examples, in rows of 16 or 20 on the board. Let one pupil start at one end, and one at the other, working toward the middle, and see which pupil gets the most problems before the two meet.

3. Using your books or a board copy, find which one can finish the most correctly in ½ minute; ¾ minute, in one minute.

4. Find which one can work them all correctly in the least time.

5. Try Exercise I, p. 256. Find out how your work compares with that of the other children in the class.

How nearly do you reach the standard given in the book?

## FARM PROBLEMS

Market Prices[1]

| | | | | | |
|---|---|---|---|---|---|
| Wheat | $0.90 | Pears | $1.75 | Beets | $0.10 |
| Rye | .65 | Plums | 1.25 | Calves | .12 |
| Oats | .45 | Cherries | .10 | Lambs | .18 |
| Corn | .70 | Grapes | .35 | Chickens | .14 |
| Buckwheat | 1.00 | Potatoes | .55 | Turkeys | .18 |
| Cloverseed | .40 | Sw. Potatoes | .60 | Ducks | .15 |
| Apples | 2.50 | Turnips | .50 | Geese | .12 |
| Peaches | 1.10 | Onions | .60 | Milk, 100 lbs. | 1.55 |

Mr. Harry Handy, a bright young clerk in a business house in the city, invested his savings in a farm. The third year after moving to the farm he marketed the following products.

| | | | | | |
|---|---|---|---|---|---|
| **1.** | Wheat | 550 bu. | **13.** | Milk | 47300 lbs. |
| **2.** | Rye | 60 " | **14.** | Potatoes | 273 bu. |
| **3.** | Oats | 725 " | **15.** | Sw. Pot's. | 14 " |
| **4.** | Corn | 1030 " | **16.** | Turnips | 9 " |
| **5.** | Buckwheat | 15 " | **17.** | Onions | 11 sacks |
| **6.** | Cloverseed | 120 lbs. | **18.** | Beets | 152 bunches |
| **7.** | Apples | 145 bbls. | **19.** | Calves | 396 lbs. |
| **8.** | Peaches | 62 bu. | **20.** | Lambs | 232 " |
| **9.** | Pears | 18 " | **21.** | Chickens | 275 " |
| **10.** | Plums | 3 " | **22.** | Turkeys | 147 " |
| **11.** | Cherries | 16 bxs. | **23.** | Ducks | 85 " |
| **12.** | Grapes | 38 bask. | **24.** | Geese | 72 " |

**1.-24.** At the market quotations given in the table above, how much did Mr. Handy receive for each item?

**25.** What were his total receipts for the year?

Show the children how they may simplify this problem by finding for example: the sum of the first six amounts, then that of the next six, etc. adding these four sums to find the total amount.

In fitting up his farm, Mr. Handy had many purchases to make. Some of the most important of these are named on the margin of this page.

Horses
Cows
Sheep.
Pigs
Harness
Saddles
Wagons
Plows
Harrows
Hoes
Spades
Shovels
Pitchforks
Hammers
Hatchets
Axes
Saws
Augers
Nails
Tool chest
Scythes
Grindstone
Wheel barrow
Saw horse
Fence wire
Nuts
Bolts
Mower
Reaper
Hay rake
C. planter
Bu. baskets
½ bu. Meas.
Pk. Measure
Qt. Measure
Sacks
Lanterns

1. Mr. Handy's first purchase included 4 work horses, and for these he paid, respectively, $135.00, $110.00, $87.50 and $125.00. What was the total amount paid for horses?

2. He bought 9 selected cows, as follows: 4 Jerseys at $60.00 each, 3 Holsteins at $48.50 each, and 2 Alderneys at $45.00 each. Find the cost of the cows.

3. He also bought 24 Cotswold sheep at $12.00 each; and 10 Berkshire pigs, for which he paid $37.60 in all. What did his sheep and pigs cost?

4. Mr. Handy bought 3 farm wagons and for these he paid as follows: 1 road wagon, $97.50; 1 market wagon, $68.75, and one wagon for delivering milk, $71.00. What did his wagons cost?

5. Find the total cost of the following purchases: 1 steel-beam plow, $10.50; 1 two-section harrow, $4.60; 1 mower, $35.70; 1 hayrake, $21.50; 1 lawn mower, $4.90.

6. Also the following items: 2 sets harness, $18.25 each; 1 drop-force corn planter, $25.40; 1 all steel cultivator, $5.50; 4 hoes, 45 cts. each; 2 shovels, 65 cts. each; 1 garden rake, 50 cts.

### KITCHEN GARDEN PROBLEMS[1]

| | | | | | |
|---|---|---|---|---|---|
| Spring Chicken | $0.18 | Lettuce | $1.25 | Watermelons | $0.20 |
| Eggs | .22 | Celery | .20 | Cantaloupes | .05 |
| Early Potatoes | .65 | Early Squash | .25 | Tomatoes | .35 |
| Radishes | .35 | Early Peas | .08 | Cabbage | 1.60 |
| Early Onions | .90 | Strawberries | .12 | Horse Radish | .10 |
| Cucumbers | .40 | Blackberries | .15 | Spinach | .50 |
| String Beans | .45 | Raspberries | .12 | Rhubarb | .35 |
| Beets | .10 | Gooseberries | .15 | Asparagus | .25 |
| Carrots | .45 | Currants | .14 | Egg Plant | .15 |

Mrs. Handy and the children earned some money too. Together they planted and took care of a vegetable garden. They also raised chickens and sold eggs. The second year they made the following sales.

| | | | | | |
|---|---|---|---|---|---|
| **1.** | S. Chickens | 64 lbs. | **14.** | Egg Plant | 42 |
| **2.** | Eggs | 276 doz. | **15.** | E. Squash | 29 |
| **3.** | E. Potatoes | 38 bask. | **16.** | E. Peas | 43 lbs. |
| **4.** | Radishes | 112 bunch | **17.** | Tomatoes | 91 bask. |
| **5.** | E. Onions | 79 sacks | **18.** | Cabbage | 127 crates |
| **6.** | Cucumbers | 56 boxes | **19.** | Spinach | 53 tubs |
| **7.** | Str. Beans | 37 boxes | **20.** | Currants | 36 boxes |
| **8.** | Beets | 182 bunch | **21.** | Strawberries | 214 " |
| **9.** | Carrots | 55 " | **22.** | Blackberries | 47 " |
| **10.** | Lettuce | 148 cases | **23.** | Raspberries | 96 " |
| **11.** | Celery | 102 bunch | **24.** | Gooseberries | 62 " |
| **12.** | Rhubarb | 75 " | **25.** | Horseradish | 35 roots |
| **13.** | Asparagus | 60 " | **26.** | Watermelons | 85 |

**1.-26.** What amount did they receive for each item?

**28.** Find the total amount of their sales for that year.

---

[1] Prices of farm and garden products are governed largely by the locality and the season. The prices scheduled here, as also on page 180, are given as approximate or average prices. See note p. 180.

Many articles are needed in furnishing a home. Some of the things Mrs. Handy bought for her house are mentioned on the margin of this page.

Beds
Bedding
Stoves
Tables
Chairs
Dishes
Cutlery
Spoons
Pots
Kettles
Pans
Trays
Tubs
Wringer
Brooms
Dusters
Carpets
Rugs
Clocks
Pictures
Book-rack
Ink-stand
Sewing mach.
Lamps
Writing desk
Ice-Box
Curtains
Ironing board
Clothes basket
Clothes brush
Bread box
Mirrors
Irons
Towels
Bird cage
Music box
Calendar

1. What was the cost of three bedsteads, 1 at $33.50, 1 at $27.25, and 1 at $18.00.

2. Of 3 bedsprings at $14.00 each?

3. Of $\frac{3}{4}$ dozen sheets at 90 cts. each? 6 yds. ticking at 30 cts. per yard? and ten pillow slips at 24 cts. each? $\frac{1}{2}$ dozen blankets at $4.50 each, and $\frac{1}{4}$ dozen bedspreads at $1.50 each?

4. Of 1 kitchen stove at $32.50, 1 parlor stove at $22.00, and 1 hall stove at $16.25.

5. Of 1 dining room table at $21.60, 1 parlor table at $16.00, and 1 sewing table at $5.25.

6. Of $\frac{1}{2}$ dozen dining room chairs at $2.50 each, $\frac{1}{2}$ dozen parlor chairs at $7.50 each, 4 bedroom chairs at $1.75 each and 2 kitchen chairs at $1.50 each?

7. Of 1 pantry and kitchen outfit at $12.50, 1 set dishes at $20.00 and of other dining room articles at $5.75?

8. Of 42 yards carpet at 63 cts. per yard, 2 rugs at $7.25 each, 1 sewing machine at $32.50, 1 clock at $5.50, 1 mirror at $4.75, 2 brooms at 35 cts. each?

## PRACTICE REVIEW PROBLEMS

Copy these tables, and write the product of each item in the columns opposite. At the bottom of each column give the total amount.

A fruit vender sold to a family the following fruits at the prices stated, *by the dozen:*

| | $ | cts. |
|---|---|---|
| **1.** 4 doz. bananas at 25 cts. | | |
| **2.** 4 doz. plums at 30 cts. | | |
| **3.** 2 doz. lemons at 35 cts. | | |
| **4.** 3 doz. oranges at 30 cts. | | |
| **5.** $\frac{1}{2}$ doz. pineapples at $2.40 | | |
| **6.** What was the total cost of the fruit? | | |

The children in Roberta's school gave a picnic. For this picnic the "supply committee" bought:

| | $ | cts. |
|---|---|---|
| **1.** 3 lbs. ginger wafers at 20 cts. per lb | | |
| **2.** 4 pkgs. Uneeda Biscuits at 5 cts. per pkg. | | |
| **3.** $2\frac{1}{2}$ lbs. cheese at 20 cts. per lb. | | |
| **4.** 6 tins sardines at 15 cts. per tin. | | |
| **5.** 5 lbs. "mixed" candies at 25 cts. per lb. | | |
| **6.** What was the total cost of these supplies? | | |

A groceryman shipped the following cereals by parcel post to an out of town customer:

| | $ | cts. |
|---|---|---|
| **1.** 5 pkgs. Quaker Oats at 10 cts. per pkg. | | |
| **2.** 4 pkgs. Rolled Oats at 11 cts. per pkg. | | |
| **3.** 3 pkgs. Wheatena at 15 cts. per pkg. | | |
| **4.** 6 pkgs. Cream of Wheat at 14 cts. per pkg. | | |
| **5.** 3 pkgs. Grape Nuts at 13 cts. per pkg. | | |
| **6.** 4 pkgs. Shredded Wheat Biscuit at 12 cts. pkg. | | |
| **7.** 2 pkgs. Puffed Rice at 13 cts. per pkg. | | |
| **8.** 3 pkgs. Post Toasties at 10 cts. per pkg. | | |
| **9.** What was the total charge for these goods? | | |

### DAYS, WEEKS AND MONTHS

**1.** There are seven days in a week. How many days are there in eight weeks?—in ten weeks?—in six weeks?

**2.** How many weeks are there in forty-two days?—in forty-nine days?—in fifty-six days?—in sixty-three days?

**3.** From a calendar, find the number of days in each month. Find the number of days in a year by adding these numbers.

**4.** There are — days in a week. Find how many weeks there are in a year.

**5.** A fortnight is 14 days. 70 days are how many fortnights?

**6.** There are twelve months in the year. How many months are there in four years?

**7.** Find the actual number of days in your present *school* year.

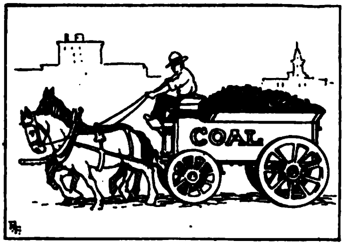
**8.** Not counting out anything for vacations, find the number of school weeks in this time.

**9.** This is how many school days?

**10.** Count the number of these days you are given for holidays, Christmas, Spring vacation, etc. Subtracting this number from the total number of school days, see how many *days of school* there are in a school year.

**11.** From Ex. 7, you found the *actual number* of days in a school year is —. From Ex. 10 you have found the number of *school days* in this time. What does the difference between these two represent?

## THE TON



Hay, iron ore, coal and some other articles are measured by the ton.

**A Ton = 2000 pounds.**

**1.** You have probably seen freight cars filled with coal. A car holding 40 tons, carries how many pounds of coal?

**2.** In the city, coal is usually delivered in 100 pound sacks. A ton fills how many such sacks?

**3.** It takes 14 tons of coal to heat a certain house during the winter. What does this cost at $8.25 a ton?

**4.** A certain business house uses 120 tons of bituminous (soft) coal in a winter. Find the cost at $4.25 a ton.

**5.** In the ore pits of the Lake Superior region, there are steam shovels which lift out 5 tons of ore at a scoop. How many pounds does such a shovel take at one time?

**6.** A certain 20 room school house requires about 1500 lbs. of coal a day to heat it during cold weather. This is how many pounds a week, including Sunday?

**7.** This is equal, in "round numbers" to how many tons? What is its cost at $8 per ton?

**8.** Two horses are pulling a wagon which weighs 3000 pounds. The wagon has in it 3800 pounds of coal. Including the weight of the driver, 200 pounds, the horses are pulling — pounds? This is how many tons?

**9.** In a certain year, the number of tons of coal mined, in the leading coal states was as follows:

| | | | |
|---|---|---|---|
| Pennsylvania, | 200,575,617 | Ohio, | 27,731,640 |
| Illinois, | 41,480,104 | Alabama, | 13,107,963 |
| West Virginia, | 42,290,350 | Indiana, | 12,092,560 |

Find the total number of tons mined by these six states together.

**10.** The value of the anthracite (hard) coal mined in Pennsylvania during a certain year was $148,957,894. The value of the anthracite coal reported from other states was $222,577. Find the value of the total output for that year.

**11.** This same year all the bituminous (soft) coal mined in this country was valued at $401,333,395. It was worth how much more than the anthracite?

**12.** A certain locomotive engine in a day's run burns 15,000 pounds of coal. This is how many tons?

**13.** Harvey's father sold 80 bales of hay, average weight 75 lbs. What was the total weight in tons?

**14.** An Oregon fish cannery put up, in one season, 500 tons of salmon. How many 1 lb. cans would this fill?

**15.** If certain sheep average 6 lbs. of wool a year, it will require how many such sheep to grow 12 tons of wool?

**16.** A bale of cotton weighs 500 pounds. How many such bales together weigh a ton?

**17.** How many together weigh 6 tons?

**18.** How many pounds in a ton?

### THE MILE

Name some distances in your home city or neighborhood which you know to be about a mile.

**1.** In many cities, 8 city blocks are considered a mile. A mile is 5280 feet long. When counting 8 blocks to the mile, what is the length of each block?

**2.** Sometimes the blocks are shorter than in Example 1. When each block is only 440 feet long, how many are considered a mile?

**3.** Lengths of railways, rivers and a number of other distances are stated in miles. Try to think of at least two other distances that are measured by the mile.

**4.** In going once around a certain athletic track a boy runs $\frac{1}{2}$ mile. How many feet is this?

**5.** Find the height in miles of the following well-known mountain peaks[1].

Mt. Everest (Asia), highest in the world, 29,002 ft.
Mt. McKinley (Alaska), highest in North America, 20,464 ft.
Kilimanjaro (highest in Africa), 19,780 ft.
Mt. Logan (Canadian Rockies), highest in Canada, 19,539 ft.
Orizaba (highest in Mexico), 18,314 ft.
Mt. Blanc (Alps), highest in France, 15,781 ft.
Pike's Peak (Colorado), 14,111 ft.
Fujiyama (Japan), sacred mountain, 12,365 ft.
Mt. Etna (Sicily), famous in legend, 10,835 ft.
Kusciusko, highest in Australia, 7,836 ft.
Mt. Mitchell (Appalachians), highest in eastern U. S., 6,711 ft.
Mt. Washington (White Mts.), 6,279 ft.
Vesuvius (Italy), 4,200 ft.

---

[1] The numbers of feet remaining can be reduced to a fraction of a mile in this way. Let the class work out on the board a table showing in order of size, parts of a mile from $\frac{1}{2}$ through $\frac{1}{12}$. By comparison with this table find which part the remainder is nearest. This approximate reduction is adequate for the present purpose.

### THE MILE

**6.** The greatest height reached by any mountain climber is about 24,000 feet or —— miles.

**7.** Men have gone up in balloons to heights of nearly 6 miles or ———— feet.

**8.** Balloons without men have risen 52,800 feet or —— miles.

Your geography tells you that very high mountains are covered with ice and snow all the year around. It also says that in climbing these mountains, one goes higher than the clouds. Children sometimes ask this question, "If the tops of the mountains are above the clouds, how can any snow fall on them? The next problem will give the reason.

**9.** Clouds vary in height. Some are not more than 1000 ft. above the earth, or about what part of a mile?

**10.** Rain clouds are not often more than $\frac{1}{2}$ mile or —— feet above the earth.

**11.** Certain thin, feathery, white clouds are usually more than 26,400 feet above the earth's surface. This is —— miles.

Children sometimes have a mistaken notion as to the height of tall buildings.

**12.** Eiffel Tower, Paris, the tallest structure in the world is 984 feet high. This is about what part of a mile?

**13.** The Woolworth building, New York, 55 stories in height, is next, 750 ft. tall. This is about what part of a mile?

Other tall buildings are the Metropolitan Life Insurance Building, 700 ft., and the Singer Building 612 ft. Both are in New York City.

## THE ROD AND THE ACRE

You may have heard some one say that a certain field is 40 *rods* long, or 25 *rods* wide.

Like the foot and yard the rod is used for measuring length. But it is used for measuring longer distances than they are, because a rod = 16½ feet.

1. On your schoolroom floor, or the playground, draw a line 1 rod long marking it off into — feet.

2. How tall are you? A rod is about how many times as long as you are tall?

3. How many rods would one walk following the fence around a pasture 40 rods square?

4. As there are 320 rods in a mile, what part of a mile would this be?

If you have lived in the country you know that the size of a farm is given in *acres*. The acre is used for measuring large surfaces, as the square inch, square foot and square yard are used for measuring small ones. An acre contains 160 square rods, but it does not have to be square.[1]

5. Children who do not live in the country do not always know how large an acre is, because in the city land is measured by the lot or square block.

6. A full city block is $\frac{1}{8}$ mile long on each side. How many rods long and wide is this?

7. It contains — square rods. This is — acres.

Smaller city blocks contain from 2 to 5 acres.

8. If possible find how many acres in your school yard, including the part the building covers.

---

[1] If you have inch squares let the children work out some of the different dimensions a rectangular acre could have.

## (Made by a Real Boy)

Money received. Money paid out

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | 1 | Bal. brought forward | | .75 | May | 1 | Hair cut | | 25 |
| | 4 | Work in garden | | .30 | | 3 | Street car fare | | 05 |
| | 8 | Caring for chickens | | 75 | | 4 | Map. | | 01 |
| | 12 | 2 hrs. work in garden | | 20 | | 14 | Car tickets | 1 | 00 |
| | 15 | Running errands | | 05 | | 17 | Candy | | 02 |
| | 17 | Digging dandelions | | 35 | | 23 | Sunday School | | 10 |
| | 19 | " " | | 15 | | 31 | Pencil | | 05 |
| | 24 | Weeding garden | | 25 | | 31 | Candy | | 02 |
| | 29 | Caring for chickens | | 25 | | | | | |
| | | | | | | | | | |
| June | 1 | Bal. brought forward | | | | | | | |

1. What was Jack's income during the month of May?

2. How much money did he spend in this month?

3. What is his "balance brought forward" June 1?

4. During the month of June Jack's account was as follows: Received—June 3, cutting lawn, 25¢; June 12, caring for chickens, 25¢; June 19, picking strawberries, 50¢; June 26, work in garden, 40¢; June 29, cutting lawn, 25¢.

Paid out—June 18, tennis shoes, 75¢; 2 tennis balls, 60¢.

Arrange in the form he used for his May account, and find his "balance brought forward," July 1.

5. Perhaps you earn or are given certain sums of money each month. Can you not keep a cash account for yourself in this way?

6. Or you may wish to make one in this form, telling the ways in which you would like to earn money for one month, and how you would spend it.

7. If you do not wish to do either of these things, supply dates and items for the following:

First Month: Received, 10¢, 25¢, 15¢, 20¢, 15¢, and 50¢.
Paid out, 10¢, 20¢, 25¢, and 15¢.
Second Month: Received, 5¢, 20¢, 10¢, 25¢, and 15¢.
Paid out, 10¢, 5¢, 15¢, and 25¢.

## DRILLS FOR SPEED AND ACCURACY

### II. Subtraction

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 8 | 7 | 9 | 4 | 6 | 8 | 9 | 9 | 5 |
| 4 | 7 | 5 | 7 | 4 | 5 | 8 | 3 | 5 | 3 |
| 6 | 5 | 8 | 6 | 8 | 6 | 7 | 9 | 5 | 9 |
| 3 | 4 | 5 | 6 | 4 | 2 | 7 | 9 | 5 | 4 |
| 7 | 8 | 5 | 7 | 8 | 9 | 7 | 9 | 8 | 9 |
| 4 | 6 | 2 | 3 | 2 | 6 | 6 | 8 | 3 | 2 |
| 10 | 12 | 10 | 12 | 11 | 10 | 12 | 12 | 15 | 11 |
| 2 | 2 | 5 | 8 | 1 | 3 | 3 | 7 | 5 | 4 |

Try yourself out on these facts. See p. 179, I, 1, 2, 3.

Can you write the correct answer as fast as your teacher shows you flash cards with these subtraction facts on them? Very likely if you cannot think of some of them in time, you do not really know them. Study those especially.

Try exercise II, p. 256. Get your record as before.

These drills cannot always be placed in the book just as they are to be used, since the time spent upon them varies with classes. Continue with the following pages, as you are ready, referring to this page for the drill part of the lessons so long as profitable.

### III. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 4 | 4 | 1 | 2 | 2 | 5 | 7 | 5 | 3 |
| 2 | 0 | 4 | 9 | 1 | 4 | 0 | 1 | 4 | 9 |
| 3 | 1 | 3 | 3 | 8 | 5 | 1 | 3 | 0 | 5 |
| 9 | 2 | 6 | 6 | 7 | 8 | 1 | 3 | 1 | 6 |
| 1 | 6 | 1 | 0 | 9 | 8 | 7 | 5 | 1 | 8 |
| 9 | 5 | 4 | 4 | 8 | 6 | 2 | 8 | 7 | 4 |

**1.** In these three-line problems try to see at least two figures as one when you add. For example, in the first, if you add down, try to think "9, 12." What figures do you think of as 9?

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 12 | 11 | 16 | 13 | 11 | 11 | 11 | 17 | 25 |
| 9 | 7 | 5 | 8 | 3 | 4 | 7 | 10 | 8 | 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 11 | 10 | 16 | 24 | 16 | 12 | 10 |
| 10 | 14 | 18 | 10 | 11 | 6 | 22 | 12 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15 | 11 | 15 | 12 | 10 | 16 | 14 | 12 |
| 10 | 11 | 15 | 12 | 11 | 14 | 14 | 18 |

**2.** In the two-line problems add as if the numbers were of only one order. In adding numbers like 24, and 14 think "24, 34, 38," adding first the 10, then the 4, in the 14.

**3.** Use flash cards for this drill as told on p. 192.

**4.** Try Exercise III, p. 256 and the next day, try Exercise IV, p. 257. Keep your records.

**Before proceeding to the regular drill, take up enough problems in this way to make sure the children have grasped the grouping idea and are ready to *use* it.**

### V. Multiplication and Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 6 | 8 | 5 | 4 | 9 | 8 | 3 | 5 | 8 |
| 2 | 3 | 7 | 7 | 5 | 5 | 6 | 7 | 8 | 4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 8 | 7 | 9 | 8 | 3 | 6 | 5 | 4 |
| 8 | 9 | 5 | 7 | 4 | 9 | 9 | 7 | 6 | 6 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 6 | 4 | 5 | 3 | 7 | 8 | 4 | 7 | 9 |
| 5 | 6 | 8 | 5 | 6 | 5 | 8 | 7 | 6 | 9 |

**1.** See which of these you need to study.

**2.** When your teacher writes these problems across the blackboard as fast as she can write, can you keep up, writing the answers in order?

**3.** Read the answers with 1, 2, 3, or 4, etc., added to them.

**4.** Try Exercise V, p. 257. In how much less time must you work this exercise to reach the standard?

## SCHOOL STORE INVENTORY

The children whose store you see on p. 74, made an inventory of their stock. It was in part as follows:[1]

I. Breakfast Foods:

| | | |
|---|---|---|
| 3 boxes of Quaker Oats | @ | $0.25 |
| 9 " " " " | @ | 0.10 |
| 2 " " Puffed Wheat | @ | 0.15 |
| 21 " " Corn Flakes | @ | 0.10 |
| 8 " " Krumbles | @ | 0.15 |
| 3 boxes of Wheatena | @ | 0.15 |
| 1 box of Post Toasties | @ | 0.10 |

**1.** There are how many boxes @ $0.25?

How many @ $0.15? How many @ $0.10?

**2.** Find the total value of the breakfast foods.

II. Canned and Bottled Goods:

| | | |
|---|---|---|
| 10 cans of Campbell's soup | @ | $0.10 |
| 6 " " Hawaiian pineapple | @ | 0.10 |
| 4 " " " " | @ | 0.15 |
| 8 " " Green Peas | @ | 0.15 |
| 3 " " Tomatoes | @ | 0.15 |
| 4 " Baked beans | @ | 0.15 |
| 5 " " Corn | @ | 0.13 |
| 5 " " Karo Corn Syrup | @ | 0.10 |
| 8 bottles of Olives | @ | 0.25 |
| 4 " " Catsup | @ | 0.15 |
| 12 " " Flavoring extract | @ | 0.15 |

**3-17.** Find the value of each item.

**18.** What is the combined value of the canned goods mentioned?

---

[1] As reference to pp. 74 and 75 shows, the articles listed in this inventory, were for the most part represented by the cans or boxes which had held them.

## III. Cocoa, Tea, Coffee, Chocolate, etc.

| | | |
|---|---|---|
| 3 1-lb. cans of Chase and Sanborn coffee | @ | $0.35 |
| 2 lbs. “ Manor House coffee | @ | 0.40 |
| 2 1-lb. “ “ Ridgeway's Tea | @ | 0.65 |
| 8 1-lb. “ “ Lipton's Tea | @ | 0.60 |
| 6 “ “ Lowney's Cocoa | @ | 0.25 |
| 5 small “ “ Huyler's “ | @ | 0.15 |
| 5 ½-lb. pkgs. of Baker's Chocolate | @ | 0.18 |

**20.** What is the value of all the coffee?

**21.** Find the value of the tea.

**22.** How much are the cocoa and chocolate worth?

**23.** Find the combined value of the items under heading III.

## IV. Milk, butter, eggs, etc.

| | | | | | |
|---|---|---|---|---|---|
| 15 1-lb. pkg. of creamery butter | @ | $0.42 | 9 quart bottles of milk | @ | $0.08 |
| 1 5-lb. crock of dairy butter | @ | 0.35 | 8 pint bottles of milk | @ | 0.05 |
| 12 1-doz. pkg. of selected eggs | @ | 0.38 | 3 ½-pint bottles cream | @ | 0.10 |

**24, 25, 26.** Find separately the value of the eggs, creamery and dairy butter.

**27.** What is the value of the milk and cream?

**28.** Find the combined value of the items under heading IV.

## V. Miscellaneous.

| | | | | | |
|---|---|---|---|---|---|
| 4 boxes of Domino sugar | @ | $0.30 | 3 bxs. Minute Tapioca | @ | $0.10 |
| 12 lbs. of granulated sugar | @ | 0.07 | 1 25-lb. sack of flour | @ | 0.85 |
| 9 boxes of Dromedary dates | @ | 0.10 | 1 bushel of potatoes | @ | 0.35 |
| 4 packages of seeded raisins | @ | 0.12 | 8 cans Dutch Cleanser | @ | 0.15 |

**29.** Find the combined value of the articles under heading V.

**30.** What is the combined value of all the items listed in this inventory?

### PRACTICE PROBLEMS—HOUSEHOLD SUPPLIES

The Saturday sales of Mr. Harold Smith, a retail groceryman, a certain week, included the following family supplies.

| | | | | |
|---|---|---|---|---|
| 1. | Butter | 37 lbs. Riverside Creamery | @ | $0.28 |
| 2. | Eggs | 62 doz. "Strictly fresh" country | @ | .22 |
| 3. | Cheese | 19 lbs. American | @ | .18 |
| 4. | Bread | 32 loaves "Mothers" | @ | .05 |
| 5. | Crackers | 21 lbs. Soda Premium | @ | .10 |
| 6. | Maple syrup | 49 gal. Granite State | @ | 1.55 |
| 7. | Apples | 120 lbs. Greenings | @ | .07 |
| 8. | Peaches | 23 bas. Freestone | @ | .35 |
| 9. | Pears | 5 " Bartlett | @ | .25 |
| 10. | Plums | 3 " Michigan | @ | .38 |
| 11. | Grapes | 14 " Concord | @ | .40 |
| 12. | Cherries | 8 bxs. | @ | .15 |
| 13. | Potatoes | 96 lbs. Virginia | @ | .03 |
| 14. | Onions | 12 " White | @ | .05 |
| 15. | Beets | 16 " | @ | .05 |
| 16. | Turnips | 17 " Yellowsaps | @ | .05 |
| 17. | Parsnips | 14 " | @ | .05 |
| 18. | Carrots | 10 " | @ | .03 |
| 19. | Chickens | 60 " | @ | .28 |
| 20. | Turkeys | 48 " | @ | .30 |
| 21. | Ducks | 26 " Mallard | @ | .17 |
| 22. | Geese | 28 " Watertown | @ | .16 |
| 23. | Quails | 7 each | @ | .40 |
| 24. | Squabs | $\frac{1}{2}$ doz. per doz. | @ | 5.00 |

**1-24.** What was the amount of each sale?

**25.** What were the receipts from all these items together?

### PRACTICE PROBLEMS

Mr. Smith's sales of canned goods and dried fruits during the same day included the following:

I. Prepared Soups

| | | | | |
|---|---|---|---|---|
| 1. | Consomme (kôn-so-ma′) | 3 cans | @ | $0.10 |
| 2. | Bouillon (Bool′-yôn) | 2 “ | @ | .10 |
| 3. | Ox-tail | 5 “ | @ | .10 |
| 4. | Tomato | 4 “ | @ | .10 |
| 5. | Vegetable | 6 “ | @ | .10 |

II. Canned Vegetables

| | | | | | |
|---|---|---|---|---|---|
| 1. | Beans | 4 cans | Lima, Green | @ | $0.22 |
| 2. | Peas | 3 “ | Marrowfat | @ | .14 |
| 3. | Asparagus | 3 “ | Golden Crown | @ | .25 |
| 4. | Succotash | 2 “ | Butter-Beans and Corn. | @ | .13 |
| 5. | Tomatoes | 4 “ | Stewed and Strained | @ | .15 |

III. Canned Fruits

| | | | | | |
|---|---|---|---|---|---|
| 1. | Peaches | 7 cans | yellow free, 2½ lb | @ | $0.25 |
| 2. | Pears | 4 “ | Bartletts, 3 lb | @ | .35 |
| 3. | Apricots | 5 “ | Extra Standard, 2½ lb | @ | .17 |
| 4. | Plums | 3 “ | California Egg | @ | .17 |
| 5. | Pineapple | 6 “ | Hawaiian, (Ha-wi′-yan) | @ | .25 |
| 6. | Cherries | 2 “ | Red, 2 lb., pitted | @ | .28 |

IV. Dried Fruits

| | | | | | |
|---|---|---|---|---|---|
| 1. | Raisins | 6 lbs. | Malaga(Mal′-à-gá)Clusters | @ | $0.20 |
| 2. | Dates | 3 bxs. | Magnums, pitted | @ | .25 |
| 3. | Figs | 4 “ | Imperials | @ | .35 |
| 4. | Currants | 5 “ | Casalina | @ | .12 |

**1.—5.** Find the total amount of sales in each group.

**6.** What were the combined sales of all the groups?

### SCHOOL-HOME PROJECT PROBLEMS

**1.** With some money he had earned, Paul bought 5 dozen baby chicks at $0.11 each. How much did they cost?

**2.** He also bought a hover for $6.50, 2 gallons of kerosene @ $0.12 a gallon for heating it, a pen for $2.50 and 2 brooder drinking fountains at $0.25 each. What was the cost of all these things?

**3.** He purchased, besides, 5 lbs. of cut alfalfa for $0.20; 2 packages of milk mash at $0.25 a package; and 10 lbs. of baby chick feed at 5 lbs. for $0.15. What did this food for his chickens cost altogether?

**4.** Find the total amount he spent for chicks, hover, pen, fountains, oil and food.

**5.** He kept his chicks in the hover 3 weeks. It took on the average a quart of oil per day to heat his hover. How many quarts were used in this time?

**6.** This was how many gallons?

**7.** Find the cost at $0.12 a gallon.

When the chicks outgrew the pen, his father gave him a piece of ground in the back yard on which to build a coop and yard.

**8.** This plot of ground was 26 feet long and 12 feet wide. At one end of this lot, with his father's help, Paul built a coop 9′x12′. How many square feet of the ground did the coop cover?

**9.** Letting $\frac{1}{4}$ inch represent a foot draw a diagram of Paul's plot of ground. Show how much the coop covered.

### POULTRY PROBLEMS

**10.** How long and how wide was the part left for the yard?

**11.** On how many sides was there a fence? How many feet was it around these sides?

**12.** Paul used poultry netting 6 feet wide. How many square feet were there in his fence?

**13.** Find the cost at 2 cents a square foot.

**14.** Paul lost a number of his chickens. Seven died the first week, and 4 later. A rat or weasel carried off 3; while the cat caught 2. How many did he succeed in raising?

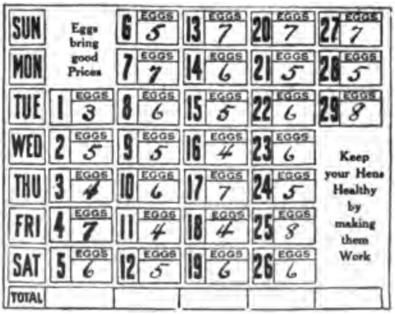
**15.** Of these 15 were roosters. How many hens did he have?

**16.** When the chickens were about 3 months old, Paul sold 18 at $0.65 apiece. What did he receive from their sale?

**17.** He sold to another boy 1 rooster at 70 cents, and 7 hens at 60 cents apiece. What did these sales bring him?

When his hens were old enough to lay, Paul sold eggs to his mother and the neighbors. He marked on a calendar the number of eggs he found each day.

During the month of February his hens laid as shown in the calendar.



| | | | | | |
|---|---|---|---|---|---|
| SUN | Eggs bring good Prices | 6 EGGS 5 | 13 EGGS 7 | 20 EGGS 7 | 27 EGGS 7 |
| MON | | 7 EGGS 7 | 14 EGGS 6 | 21 EGGS 5 | 28 EGGS 5 |
| TUE | 1 EGGS 3 | 8 EGGS 6 | 15 EGGS 5 | 22 EGGS 6 | 29 EGGS 8 |
| WED | 2 EGGS 5 | 9 EGGS 5 | 16 EGGS 4 | 23 EGGS 6 | Keep your Hens Healthy by making them Work |
| THU | 3 EGGS 4 | 10 EGGS 6 | 17 EGGS 7 | 24 EGGS 5 | |
| FRI | 4 EGGS 7 | 11 EGGS 4 | 18 EGGS 4 | 25 EGGS 8 | |
| SAT | 5 EGGS 6 | 12 EGGS 5 | 19 EGGS 6 | 26 EGGS 6 | |
| TOTAL | | | | | |

### POULTRY PROBLEMS

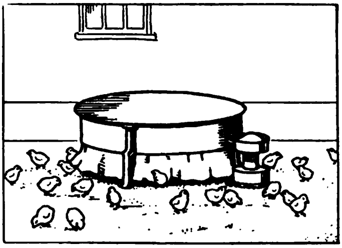
**18.** Find the number received each week. How many eggs did he receive during the entire month? This is how many dozen?

**19.** What did he receive for these at $0.48 a dozen?

**20.** During March and April he received altogether 360 eggs. Of these he received 175 in March. How many did he receive during April?

**21.** Of these he sold 14 dozen @ $0.45; 12 dozen @ $0.42; and the rest @ $0.28.

Find the amount of his sales during March and April?



The children should see at some months of the year his hens would not be so profitable.

**22.** What did he receive for his eggs during the three months?

**23.** During these three months he spent $2.75 for feed. How much did he earn from the eggs in this time?

### DRILLS FOR SPEED AND ACCURACY

### VI. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 4 | 5 | 7 | 5 | 2 | 6 | 2 | 3 |
| 1 | 6 | 3 | 3 | 1 | 3 | 2 | 0 | 5 | 1 |
| 3 | 1 | 2 | 0 | 1 | 1 | 4 | 2 | 2 | 4 |

**1.** Review III, p. 192, about adding by groups. Some of you may be able to see all three figures as one group. **2.** Use Suggestions 2 and 3 under II, p. 179. **3.** Get your record for Drill VI, p. 257.

### REVIEW PRACTICE PROBLEMS

Find the sums:

| | | | | | |
|---|---|---|---|---|---|
| **1.** | 79,640 | **2.** | 31,420 | **3.** | 56,329 |
| | 32,825 | | 96,793 | | 57,931 |
| | 21,193 | | 87,171 | | 83,822 |
| | 74,632 | | 73,612 | | 68,736 |
| | 60,219 | | 37,137 | | 41,327 |
| | 21,521 | | 28,942 | | 83,438 |

Find the differences:

| | | | | | |
|---|---|---|---|---|---|
| **1.** | 876,391 | **2.** | 743,962 | **3.** | 567,981 |
| | 432,573 | | 614,271 | | 498,432 |
| **4.** | 736,940 | **5.** | 863,847 | **6.** | 937,645 |
| | 482,733 | | 397,488 | | 829,451 |
| **7.** | 1,384,652 | **8.** | 3,219,430 | **9.** | 7,962,431 |
| | 879,610 | | 1,637,891 | | 5,617,381 |

Find the products:

| | | | | | |
|---|---|---|---|---|---|
| **1.** | 329,160 | **2.** | 497,386 | **3.** | 398,645 |
| | 45 | | 121 | | 232 |
| **4.** | 738,692 | **5.** | 681,490 | **6.** | 582,674 |
| | 52 | | 120 | | 237 |
| **7.** | 483,924 | **8.** | 564,921 | **9.** | 745,826 |
| | 73 | | 215 | | 325 |

Find the quotients:

**1.** 32)861,184
**2.** 121)432,212
**3.** 220)1,960,640
**4.** 321)2,743,908
**5.** 47)813,664
**6.** 92)624,128
**7.** 98)3,691,856
**8.** 385)4,265,800
**9.** 85)379,440
**10.** 55)692,835
**11.** 311)5,329,607
**12.** 522)6,843,942

### PROBLEMS ABOUT THE "LITTLE MARAUDERS"

Have you seen green plant lice on the sweet peas, or red ones on the golden glow?

Have you seen cabbages eaten into by green worms, or tomato plants cut off just above the roots, by cut-worms?

Have you bitten into a wormy apple or cherry?

If you have, then you know something of the damage insects do to crops. Every year, insects which prey upon the crops and forests cause millions of dollars loss to the people of the United States.

**1.** A man figured that on 1 small cherry tree there were 12,000,000 plant lice. At this rate, how many were there in a row of 25 infested trees?

**2.** Many caterpillars eat twice their weight of leaves in a day. How much do you weigh? If you ate twice your weight in bread, meat, etc., a day, how many pounds of food would you eat?

**3.** An ox weighs about 1200 pounds. If he were to eat twice his weight in hay, daily, how many pounds of hay would he eat?

**4.** This is how much more than a ton?

**5.** The value of all the grains raised in the U. S. during a certain year was estimated at $2,000,000,000. $\frac{1}{10}$ of this was lost because of insect enemies. What was the loss in dollars? **See p. 153.**

**6.** The same year the fruit crop was valued at $135,000,000. Insects destroyed $\frac{1}{5}$ of this. What was the amount of loss?

**7.** What do the problems on this page teach you about the damage done by insect enemies?

### PROBLEMS ABOUT THE "LITTLE PROTECTORS"[1]

**1.** A young robin in captivity ate from 50 to 70 cut-worms and earthworms a day, for 15 days. Taking the average number per day as 60, how many did he eat in the 15 days?

**2.** One day his owner, wanting to know just how much the bird could eat, fed it, in all, 5½ oz. of cut-worms. At 30 cut-worms to the ounce, how many did the robin eat that day?

**3.** This young bird weighed only 3 oz. That day he ate about how many times as much as his own weight?

**4.** If you should eat as much for your weight as the robin did for his, how many pounds of food would you eat in a day?

**5.** A robin carrying a grub to its young every 5 minutes carries how many in an hour?

**6.** At this rate how many will it carry in 10 hours?

The number would probably be more since robins have been seen to carry as many as 5 grubs at once.

**7.** Once, when there was a great pest of locusts, people tried to find if the birds were helping to destroy them. 6 robins who were examined had eaten 265. This was an average of how many per bird?

**8.** If 1 robin was eating 50 a day, how many was that in a week?

**9.** At the rate of 50 a day, a young robin can eat how many cut-worms in the — weeks before he is full grown?

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[1] Illustrations from Farmers' Bulletin 513, U. S. Dept. of Agriculture

### THE "LITTLE PROTECTORS"

**10.** Another of our best friends is the bluebird. 3 bluebirds examined during the locust pest had eaten 67 of the grasshoppers. This was an average of how many for each bird?

**11.** A pair of rosebreasted grosbeaks with young in the nest made trips to feed them one day as follows:

| Time | No. of trips | Time | No. of trips |
|---|---|---|---|
| 6–7 A. M. | 52 | 12–1 P. M. | 32 |
| 7–8 | 47 | 1–2 | 38 |
| 8–9 | 43 | 2–3 | 41 |
| 9–10 | 30 | 3–4 | 22 |
| 11–12 | 63 | 4–5 | 38 |

They made how many trips?

**12.** This was an average of how many trips an hour?

**13.** Almost every time they carried 2 lar′va or caterpillars. At this rate, in all their trips they carried at least how many?

The actual number was 4 less because 4 times they carried only 1. However, they have been known to carry as many as 11 at one time.

**14.** The birds frequenting a 100-acre grainfield in the south were closely studied one spring from March 29th to April 4th. It was estimated that in that time they ate plant lice each day, as follows:

| Birds present | Insects eaten | Birds present | Insects eaten |
|---|---|---|---|
| 300 goldfinches | 318,000 | 2590 Vesper sparrows | 396,225 |
| 20 Field sparrows | 15,430 | 70 Savannah sparrows | 28,570 |
| 70 Snow birds | 3,920 | 245 Chipping sparrows | 168,560 |

Find the number of birds present.

### THE "LITTLE PROTECTORS"

**15.** According to the figures given these birds together destroyed how many plant lice a day?

**16.** This, in round numbers, is how many per day?

**17.** For how many days were the birds watched?

**18.** In this number of days, at the rate found in problem 15, they destroyed how many lice?

**19.** Two scarlet tanagers were watched while eating some very small caterpillars[1] of the gypsy moth. For 18 minutes they ate at the rate of 35 a minute. At this rate how many would they eat in an hour?

**20.** Suppose they were to eat at this rate for only an hour a day. How many would they eat in a week?

**21.** If the fruit on the tree they freed from lice was worth $5, how much did each bird save the owner?

**22.** In 4 hours and 37 minutes a pair of house wrens were seen to feed their young 1 white grub; 1 soldier bug; 3 millers; 9 spiders; 9 grasshoppers; 5 May-flies; 34 caterpillars; besides 49 other insects. How many insects did they carry in.

**23.** What do the problems on the last three pages tell you about the value of our song-birds? Perhaps your teacher will find time in which to talk over with you some ways in which you can help.

[1] In many kinds of insects the eggs laid hatch into tiny worms or caterpillars. It is the young which cause such damage to crops and trees for they have very great appetites.

The American silk worm eats so much during its life of 56 days that when full grown it weighs 4140 times as much as when it was hatched.

### REVIEW PROBLEMS IN ADDITION AND SUBTRACTION

Add these problems up and prove by adding them down.

| | | | | |
|---|---|---|---|---|
| $15.80 | $27.25 | $19.15 | $372.85 | $296.55 |
| 36.35 | 43.97 | 56.11 | 353.21 | 139.18 |
| 24.55 | 55.68 | 44.34 | 248.17 | 347.22 |

Subtract and prove by addition:

| | | | | |
|---|---|---|---|---|
| $168.75 | 255.38 | $149.50 | $372.20 | $286.62 |
| 156.87 | 242.65 | 137.85 | 263.49 | 149.75 |

Add, then subtract:

| | | | |
|---|---|---|---|
| $1425.70 | $3538.65 | $2782.56 | $1827.95 |
| 1208.35 | 2319.77 | 3496.75 | 1629.58 |

Add from the bottom up. Prove by adding down.

| | | | |
|---|---|---|---|
| $228.60 | $237.95 | $175.65 | $3392.50 |
| 117.35 | 346.16 | 318.36 | 2516.75 |
| 336.58 | 419.84 | 252.80 | 1428.18 |
| 249.65 | 357.23 | 169.73 | 4291.23 |
| 372.16 | 245.75 | 241.15 | 2617.14 |

Copy these amounts in column form. Add and prove:

$15.75 $26.85 $37.48 $24.95 $38.45 $29.62

Copy these amounts in column form. Add and prove:

$137.50 $325.17 $248.33 $352.39 $275.80 $187.65

Copy these amounts in column form and subtract. Prove by addition.

$287.65 – $163.15 $368.14 – $254.63 $279.15 – $155.37

Copy these amounts in column form and subtract. Prove by addition.

$491.17 – $355.27 $268.49 – $174.38 $472.85 – $380.67

## SOME THINGS THAT OTHER CHILDREN ARE DOING

**1.** A number of the children in a certain school take a little weekly newspaper. They read it in connection with their geography and history. This year they sent their subscriptions in one order as follows:

Grade 6B, 34 subscriptions; grade 6A, 42;
grade 7B, 40; grade 7A, 44.

Find the combined amount of their order at $0.20 a subscription.

**2.** Some of the 8th grade girls had a candy sale. In making their candy they used the following materials:

8 pounds of granulated sugar @ $0.07; 1½ pounds of nuts @ $0.60; 2 quarts of milk at $0.08; 2½ -lb. cakes of chocolate @ $0.18; 2 lbs. of brown sugar @ $0.06; 4 lbs. of dates @ $0.15; ½ pound of figs @ $0.30; ¾ lb. butter @ $0.40; and flavoring, $0.05.

Find the cost of the material.

**3.** They cut each pan of fudge into 4 strips the long way with 9 strips across. Each pan held — pieces.

**4.** There were in all 360 pieces of fudge. How many pans had they made?

**5.** They put 4 pieces into each bag to sell for $0.05. How many bags did the fudge fill?

**6.** They sold all these bags, and 32 bags of stuffed dates at $0.05 a sack. What did they receive?

**7.** What did they realize from their candy making?

**8.** 4 girls had helped make the candy. What was each one's share of the profits? The girls used their money to pay for their cooking caps and aprons and other sewing supplies.

### SCHOOL PROJECT PROBLEMS

**9.** Some of the children in another school formed a little orchestra. With part of the proceeds from a concert, they bought sheet music as follows: 12 copies @ $0.07; 8 copies @ $0.06; 10 copies at $0.08; and 2 copies @ $0.09. How much did they spend?

**10.** It required the sale of — tickets at 10¢ each to pay for this.

**11.** A fifth grade class gave a "show" to which they charged 5¢ admission. So many children wanted to come that they had to repeat the performance 3 times. In all they took in $4.50. How many tickets were sold?

**12.** They bought 2 lights for their Mirroscope at $0.40 apiece; 24 postcards showing scenes on the Great Lakes; 1½ dozen on lumbering; 2 dozen on mining; 1½ dozen scenes in Florida; and 5½ dozen on other topics. All of these cards cost $0.12 a dozen. How much money did they spend in all?

**13.** How much had they left?

**14.** The sixth grade made valentines in their drawing class and outside of school. Afterward they sold their best ones to the other children. What was received from the sale of 80 valentines at $0.01 each; 30 at $0.02; 25 at $0.03; and 10 at $0.05?

**15.** The pupils in one school formed a poultry club. Hazel had 3½ dozen hens. The average egg yield for each hen was 130 eggs. How many eggs was that for the year?

**16.** How much did Hazel receive for the eggs at 30¢ per dozen?

### WHAT ARE YOU DOING?

You may not do things just like these in your school. But perhaps you are doing some things that you could use in making interesting problems.

Look around your school. See what the other rooms are doing. The problems do not have to be just about earning money.

Very likely too, there is something in which you are interested outside of school. You could make problems all your own about it, and, perhaps, see if the other children can work them.

These suggestions may help you.

1. Do you know how much milk your family uses in a week, or month, and how much it costs?

2. Have you kept pigeons, chickens, or rabbits?

3. What do you feed them, and what does the feed cost?

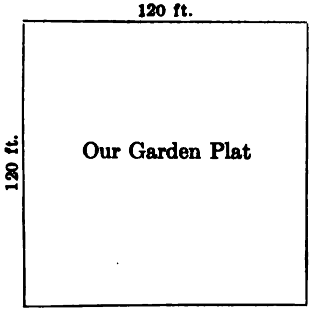
4. Do you earn money outside of school? Do you "keep track" of how you spend it?

5. Do you have a flower or vegetable garden in your yard? Do you know how large it is? How much the seeds and fertilizer cost? What your family saves in having a garden? What are the chances of earning money from a garden?

6. Do you know the cost of a new dress, or a new suit of clothes? Of your shoes and stockings? Of your hat or cap? Have you ever estimated the cost of an outfit for a boy or girl?

The teacher must use tact in keeping this work impersonal. Do not try to exhaust the possibilities of original problems in this grade. Just give the idea a fair start.

### PUPILS' OWN PROBLEMS



Original problems prepared by a fifth grade class, in a certain city school, for fourth grade pupils to solve.

I. Can you work all of these problems?

II. Can you make other problems like them?

1. How many sq. yds. are there in the area of our garden?

2. How many garden beds can be made if each shall be 20 ft. by 10 ft.? Draw a plan.[1]

3. How much will it cost to build an iron fence around our garden, not allowing for gates, at 75 cts. a ft.?

4. How much would it cost to put 12 posts on each side at 25 cts a post?

5. How far apart would they be?

6. If each post is 10 ft. long and extends into the ground 3 ft. how far would each post stick up in the air?

7. How many posts will be needed in our garden fence if they shall be placed 5 ft. apart?

8. I planted 16 rows of radishes and each row contained 50 doz. I sold them at 10 cts a doz. How much did I make?

9. What would it cost to fertilize the garden at $\frac{1}{2}$ ct. a sq. ft.?

---

[1] **All pupils' drawings of this kind should be made to a *definite scale.***

These problems were made by children in a fourth grade class very nearly in the form given. It was only necessary to simplify their problems about the wire covering, in order to adapt them for general use. This fact shows that under the stimulus of a real situation, children are able to solve more difficult problems than when the subject is foreign to their interests.

Robert bought a pair of rabbits for $0.75. His father gave him a yard 18 feet wide and 28 feet long. Robert built a hutch 4 feet wide at one end of the yard.

1. How many feet of chicken wire did he need to go around the yard, leaving out the hutch?

He had to cover the top of the yard and the bottom, under the ground.[1] He used strips of 4 foot wire extending the short way because it cut with less waste.

2. Draw in the strips 4 feet wide to show how Robert covered his yard. How much is left over at the end?

3. Then it takes a piece of wire — feet wide and — feet long to cover the roof.

4. This is how many square feet?

5. How many square feet of wire are needed for the roof and floor together?

6. At $0.01 per sq. ft. how much did the wire cost?

7. He paid $4.00 for wood for the hutch, which he, himself, built. He bought a pound of nails at $0.15. and some oats for $1.75 a sack, 2½ bu. in the sack. What did these things cost Robert?

8. During the year Robert had 48 rabbits. 6 of them died. How many did he have to sell?

9. He sold them at $0.25 apiece. How much did Robert make on his rabbits this first year?

---

[1] The wire was put under the yard to keep the rabbits from burrowing their way out.

## DRILLS FOR SPEED AND ACCURACY

### VII. Subtraction

$$\begin{array}{cccccccccc} 6 & 8 & 5 & 7 & 7 & 9 & 3 & 2 & 1 & 8 \\ \underline{2} & \underline{7} & \underline{3} & \underline{4} & \underline{2} & \underline{5} & \underline{2} & \underline{1} & \underline{0} & \underline{5} \end{array}$$

$$\begin{array}{cccccccccc} 7 & 5 & 7 & 8 & 9 & 4 & 8 & 5 & 9 & 3 \\ \underline{6} & \underline{0} & \underline{1} & \underline{8} & \underline{2} & \underline{3} & \underline{6} & \underline{5} & \underline{4} & \underline{1} \end{array}$$

$$\begin{array}{cccccccccc} 4 & 5 & 7 & 6 & 3 & 7 & 1 & 4 & 9 & 7 \\ \underline{1} & \underline{4} & \underline{7} & \underline{4} & \underline{3} & \underline{0} & \underline{1} & \underline{2} & \underline{7} & \underline{5} \end{array}$$

Use this drill as you did II, p. 210. Also try writing just the answers as fast as you hear the problems read.

Try Exercise VII, p. 258. Keep your record.

At another time during the day, or the next day, try II, p. 256, again. Do you notice any improvement?

### VIII. Division and Multiplication

For a review drill, see p. 148, 1, II, IV, V.

You may write these columns of figures beforehand on the board. Let different ones in the class, racing by twos, threes or fours, see which can fill in the second column correctly in the least time.[1]

Eight or nine at a time may try out for first, second or third place. Find the best of all the "firsts," of the "seconds," of the "thirds."

Try Exercise VIII, p. 258. Keep your record for future reference.

### IX. Addition

$$\begin{array}{cccccccccccccc} 5 & 3 & 8 & 7 & 8 & 9 & 2 & 6 & 7 & 5 & 4 & 4 & 5 & 9 \\ \underline{7} & \underline{7} & \underline{3} & \underline{6} & \underline{2} & \underline{5} & \underline{9} & \underline{5} & \underline{4} & \underline{5} & \underline{6} & \underline{8} & \underline{8} & \underline{2} \end{array}$$

Try Exercise IX, p. 258.

---

[1] A specified addition to the time in which a pupil finishes may be made for each error. At this stage, however, few mistakes are likely to be made.

### PRACTICE PROBLEMS FOR ORAL SOLUTION

**2)$1.00 5)$1.00 6)$1.00 3)$1.00 10)$1.00**

**4)$1.00 12)$1.00 8)$1.00 16)$1.00**

**1.** $\frac{1}{2}$ of a dollar = — cents.

**2.** $\frac{1}{2}$ of a dollar = $\frac{?}{4}$ of a dollar.
Then $\frac{1}{4}$ of a dollar = — cents.

**3.** $\frac{1}{4}$ of a dollar = $\frac{?}{8}$ of a dollar.
Then $\frac{1}{8}$ of a dollar = — cents.

**4.** How much per yard is cloth selling 2 yards for a dollar? 4 yards for a dollar? 8 yards for a dollar?

**5.** At $0.50 a pound, how many pounds of candy can be bought for a dollar?

**6.** At $0.25 a dozen, how many dozen apples will $1.00 pay for?

**7.** At $\$0.12\frac{1}{2}$ a yard, how many yards of gingham can be purchased with a dollar?

**8.** $\$\frac{1}{2} = ?$ $\$\frac{1}{4} = ?$ $\$\frac{1}{8} = ?$

**9.** Find by dividing as shown at the top of the page: $\frac{1}{3}$ of a dollar = — cents?

**10.** $\frac{1}{6}$ of a dollar is — cents?

**11.** $\frac{1}{3}$ of a dollar = — sixths of a dollar?

**12.** If I pay a dollar for 3 boxes of stationery, what does each box cost?

**13.** If 6 collars cost a dollar, what is the price of each?

**14.** If a hatter gains a dollar on the sale of 8 hats, what does he gain on each?

### PARTS OF A DOLLAR

**15.** When cotton costs $16\frac{2}{3}$ cents a pound, how many pounds would a dollar buy?

**16.** $\$\frac{1}{3}$ = — cents? $\$\frac{1}{6}$ = — cents?

**17.** Find by dividing: $\frac{1}{5}$ of a dollar = — cents.

**18.** $\frac{1}{10}$ of a dollar = — cents?

**19.** One-tenth is what part of $\$\frac{1}{5}$?

**20.** At $0.10 each, how many tablets can one buy for a dollar?

**21.** At $0.20 a yard, for a dollar, one can buy — yards of ribbon?

**22.** If a family saves a dollar on gas every 12 days, how much does it save each day?

**21.** If 6 pounds of bacon cost one dollar, what does the bacon cost per pound?

**24.** If 20 pounds of sugar cost one dollar, what does the sugar cost per pound?

**25.** If 8 yards of cloth cost one dollar, what does the cloth cost per yard?

Supply the missing numbers:

$0.50 = ? of a dollar.
$\$\frac{1}{5}$ = — cents.
$\$\frac{1}{3}$ = — cents.
$0.10 = ? of a dollar.
$\$\frac{1}{4}$ = — cents.
$\$0.16\frac{2}{3}$ = ? of a dollar.
$\$0.12\frac{1}{2}$ = ? of a dollar.

$\$0.33\frac{1}{3}$ = ? of a dollar.
$\$\frac{1}{10}$ = — cents.
$\$\frac{1}{6}$ = — cents.
$0.25 = ? of a dollar.
$\$\frac{1}{2}$ = — cents.
$0.20 = ? of a dollar.
$\$0.06\frac{1}{4}$ = ? of a dollar.

## ORAL MONEY PROBLEMS FOR QUICK CALCULATION

1. A quarter and two dimes can be exchanged for how many nickels?[1]

2. A quarter and three nickels less four nickels equal how many nickels?

3. A dime and two nickels and four cents, less three cents, is how much money?

4. Five cents and four cents and six cents less four cents leaves how many cents?

5. If you change a half-dollar into nickels, and lose two nickels, how many nickels will you have?

6. If you have seven cents, and find a nickel, and then lose three cents, how much money will you have?

7. If you change a half-dollar and two dimes into nickels, and spend two nickels, how many nickels will you have left?

8. If you give a half-dollar to pay for things that cost three dimes, how many nickels can you receive in change? How many dimes?

9. If you pay two nickels for carfare, and one for a telephone message, and three for a lunch, how much money will you have spent?

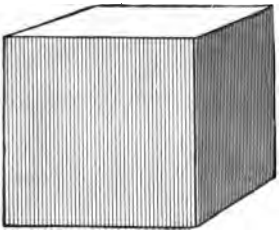
10. If you buy a magazine for five cents, and two newspapers for a cent apiece, and pay for them with two nickels, how much change will you receive?

11. If a man buys a necktie for a half-dollar, and a collar button for a dime, and pays with a half-dollar and a quarter, his change will equal how many nickels?

---

[1] Count the quarter as five nickels, and the dime as two nickels.

## CUBIC MEASURE



From your oral work in Science or Physiology, you may have learned about the reasons for having fresh air in our homes, schools, churches, and other places where people are indoors.

Perhaps you have read, or been told, that each child in your schoolroom should have 2000 *cubic feet* of pure air to breathe every hour.

**1.** How many children are there in your room? How many cu. ft. of air do you together need in an hour?

The average schoolroom does not hold nearly so much air as this. You can find out if yours does, in this way:

**2.** Find to the nearest foot the length, width, and height of your school room.

**3.** Letting an inch represent a foot, make a cardboard box to represent your room. How many inches long must it be? How many inches wide? How many inches high?

Your teacher will show you what a cubic *inch* is. A cubic *foot* is as large as a cube or square block, a foot long, a foot wide, and a foot high. In making your cardboard room, you may let a cubic inch represent a cubic foot.

**4.** By packing inch cubes, like blocks, into your paper room, find how many cubic feet your "schoolroom" contains[1].

**5.** How many cubic feet or less than the number needed in an hour does it hold?

**6.** How many hours are you in the room? How many cubic feet of air are needed for you in a day?

7. What is done in your schoolroom to provide this additional fresh air for you to breathe?

If there is a fan in your building you may be able to make some more problems about the amount of fresh air it forces in.

8. The cubic foot is used to measure other things besides air. Try to find out some of them.

9. In Henry's room at school there was a new sand-table, 8 feet long, 3 feet wide and 1 foot deep. The boys helped the janitor fill it half full with clean, white sand. How many cubic feet of sand did it take?

10. They carried the sand from the basement in pails holding about $\frac{1}{2}$ cubic foot of sand. Can you tell about how many pailfulls were needed?

11. On the playground they made a skating rink 60′ by 40′, and $\frac{1}{2}$ foot deep. How many cubic feet of water were needed to fill it?

12. In the spring the children made a place for a flower garden. Finding the ground hard clay, they removed the dirt from a space equal to a hole 1 foot deep, 10 feet long, and 3 feet wide. How many cu. ft. of good soil were needed to fill in their garden?

It is better for the teacher to develop the ideas on these pages through a conversation lesson than to have the children work directly from the text. *In this way they are made more conscious of the problem and are given a better opportunity to find the way out themselves.*

The idea that a cubic foot need not be a cube can come in the next grade when they have learned that 1728 cu. in. = 1 cu. foot, and when the question of a more convenient method of finding the cubic contents will be considered.

No formal rule for finding the cubic contents should be given in this grade. The block idea may be used to make the problems clear, but it is not necessary to make a box each time as in Ex. 3.

## DRILLS FOR SPEED AND ACCURACY

### X. Addition

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13 | 12 | 10 | 32 | 30 | 14 | 10 | 10 | 10 |
| 13 | 11 | 13 | 10 | 14 | 13 | 17 | 19 | 11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21 | 19 | 25 | 23 | 29 | 10 | 13 | 10 | 29 |
| 15 | 10 | 13 | 14 | 12 | 15 | 16 | 14 | 14 |

| | | | | | |
|---|---|---|---|---|---|
| 24 | 14 | 12 | 19 | 14 | 16 |
| 15 | 16 | 14 | 11 | 10 | 13 |

Add as if one-place numbers. See VI, p. 200.

Try Exercise X, p. 259.

### XI. Subtraction

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | 11 | 12 | 12 | 18 | 14 | 17 | 11 | 14 | 16 |
| 8 | 7 | 7 | 8 | 9 | 6 | 8 | 9 | 5 | 9 |

In most cases, from this point on, the Practice Exercise may be used directly for preliminary drill as well as for the test, the record being kept only of the latter. Occasionally let the class try to beat their record on review practice exercises.

Some of the ideas given in the "Teaching Suggestions", pp. 271–275, may be adapted for use in fourth grade to prevent the drill work from becoming too formal.

Use Exercises XII, XIII, XIV, XV, pp. 260-61 as indicated above.

### XVI. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 8 | 1 | 5 | 1 | 8 | 2 | 2 | 1 | 6 |
| 1 | 9 | 1 | 3 | 4 | 7 | 2 | 9 | 1 | 1 |
| 2 | 0 | 3 | 2 | 2 | 0 | 2 | 0 | 6 | 6 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 2 | 8 | 4 | 0 | 6 | 5 | 3 | 4 |
| 2 | 5 | 9 | 2 | 3 | 7 | 7 | 4 | 2 | 8 |
| 3 | 7 | 4 | 7 | 1 | 4 | 6 | 4 | 5 | 2 |

Group in adding. See p. 193. Try Exercise XVI, p. 261.

Review the following before taking up practice work on Exercise XVII, p. 261.

## XVII. Subtraction

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 11 | 14 | 13 | 11 | 10 | 14 | 10 |
| 7 | 5 | 6 | 9 | 7 | 9 | 5 | 2 |
| 18 | 15 | 12 | 13 | 17 | 11 | 12 | 16 |
| 9 | 7 | 7 | 4 | 8 | 3 | 5 | 7 |
| 17 | 13 | 15 | 13 | 14 | 17 | 16 | 18 |
| 9 | 8 | 6 | 6 | 7 | 7 | 9 | 8 |
| 12 | 13 | 16 | 13 | 14 | 16 | 15 | 17 |
| 6 | 3 | 8 | 5 | 8 | 8 | 9 | 6 |

## XVIII. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 6 | 9 | 3 | 5 | 6 | 1 | 7 | 9 |
| 2 | 9 | 4 | 1 | 3 | 6 | 5 | 4 | 3 | 7 |
| 7 | 0 | 5 | 0 | 5 | 7 | 3 | 7 | 2 | 2 |
| 3 | 7 | 2 | 5 | 7 | 2 | 7 | 9 | 3 | 1 |
| 5 | 3 | 2 | 7 | 2 | 3 | 5 | 7 | 5 | 7 |
| 7 | 1 | 9 | 2 | 5 | 8 | 7 | 8 | 6 | 8 |

See p. 193, about adding by groups. Try Exercise XVIII, p. 262.

Use Exercise XIX as described in VIII, p. 212.

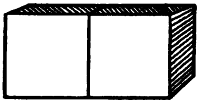
## XX. Addition

Add as if one-figure numbers, see 2, p. 211.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 12 | 11 | 14 | 8 | 6 | 5 | 11 | 14 | 10 |
| 10 | 12 | 12 | 9 | 15 | 15 | 14 | 8 | 11 | 6 |
| 9 | 5 | 9 | 5 | 5 | 4 | 4 | 5 | 3 | 6 |

Use Exercises XX to XXX excepting XXV, pp. 262-65 for practice and test.

### PROBLEMS IN VIZUALIZATION



1. How many faces has a cube?

2. Build a figure with two cubes. How many faces has it?

3. How many of the faces of this figure are squares?

4. How many are oblongs?

5. Think of a room 24 feet long, 16 feet wide and 11 feet high. What are the dimensions of the floor?

6. What are the dimensions of the sides?

7. What are the measurements for the ends?

8. How long and how wide is the ceiling?

9. A building lot 80′ x 150′ has a garden across the back as wide as the lot and 20′ from back to front. How long and how wide is the part of the lot remaining?

10. John lives a mile from school, but goes home for lunch at noon. If he uses the car for one trip, how many miles does he walk each day going back and forth to school?

11. A city car is divided into two parts by a middle aisle. On each side there are 12 double seats facing forward and an end seat long enough for 4 persons to sit on. On each side there are 4 straps. Draw a plan of the car. How many people is the car planned to accommodate with straps and seats?

Inability to picture the conditions of a problem is a very common reason why some children have difficulty with applied problems. Problems such as those on this page, of slight numerical difficulty which merely require vizualization give practice in picturing conditions.

How wide a left-hand margin do you leave on your composition, or penmanship papers, or in writing letters? Can you keep this margin without using a ruled line? You will find it very helpful to be able to tell this, without measuring.

Practice estimating measurements in some of these ways:

1. Without using the ruler show, with a light mark, the width you think the margin on your paper should be. Then take your ruler and see how nearly right you are.

2. Try drawing lines one, two or three inches in length. Then compare with the ruler.

3. Cut string or strips of paper into pieces of different lengths, some 1 inch, some $1\frac{1}{2}$, $1\frac{3}{4}$, 2 inches, $2\frac{1}{2}$ inches, etc.

4. Put these together in a pile. With your eyes shut choose one, and, without looking at any other piece, tell its length as nearly as you can.

5. You can also estimate the length and width of your books, desks, and other objects in your schoolroom.

You should also know about how long a foot and a yard are. Which of the above exercises could you use in learning to recognize a foot or a yard?

What is one way of measuring a yard without a stick or tape? See p. 10.

By marking off a rod on the floor or playground try to show how long a rod is. Review pp. 189-90.

Other ways the children may be taught to estimate distances are, finding the length and width, in feet, of the blackboard; distance, in feet, from one object to another in the schoolroom; length or width in feet, yards or rods of the school yard, and by throwing a ball and first estimating and then measuring with a foot rule, yard stick or tape-line find the distance thrown. These estimates should in all cases be verified by the pupils through actual measurement.

Each pupil should also estimate the distance in feet, yards, rods, or miles, from his home to the school.

### PRACTICE PROBLEMS—CONFECTIONERY

**1-23.** Find the cost of each item in the quantities named below.

**1.** 20 bxs. Chocolate Creams @ $1.15 per box (5 lbs.)

**2.** 10 bxs. American Cream Almonds @ .85 per box.

**3.** 12 bxs. Chocolate Marshmallows @ .90 per box.

**4.** 15 bxs. Bon Bons (assorted) @ 1.15 per box.

**5.** 10 pails Cuban Nougats @ .90 per pail.

**6.** 10 3-lb. bxs. Cream Patties @ .70 per box.

**7.** 15 lbs. Butter Scotch (400 squares) @ .60 per box.

**8.** 25 bxs. Hoarhound Squares @ .60 per box (5 lbs.)

**9.** 20 bxs. Lemon Drops @ .60 per box (5 lbs.)

**10.** 10 bxs. Molasses Mint @ .60 per box (5 lbs.)

**11.** 10 bxs. Anis Squares @ .60 per box (5 lbs.)

**12.** 10 bxs. Peanut Taffy @ .60 per box (5 lbs.)

**13.** 10 5-lb. sheets Cocoanut Taffy @ .12 per sheet.

**14.** 5 bxs. Molasses Satinettes @ .75 per box (5 lbs.)

**15.** 15 bxs. Cream Filberts @ .65 per box (5 lbs.)

**16.** 10 bxs. Chocolate Mint Wafers @ .60 per box.

**17.** 5 cans Butter Cups (nut fillings) @ 1.25 per can.

**18.** 10 bxs. Peppermint Lozenges @ .60 per box.

**19.** 10 6-lb. cans Wintergreen Mints @ 1.50 per can.

**20.** 5 bxs. Jelly Gum Drops (assorted) @ 1.00 per box.

**21.** 5 bxs. Cream Glaces (assorted) @ .85 per box.

**22.** 10 bxs. Macaroon Almonds @ .65 per box (5 lbs.)

**23.** 12 pans Caramels (assorted flavors) @ .70 per pan.

**24.** What is the total cost of the 23 items?

See note p. 180.

## PRACTICE PROBLEMS—FRUITS AND NUTS

**1-28.** What is the cost of each item named below?

**1.** 50 bbl. Apples @ $3.50 per barrel.
**2.** 75 bu. Peaches @ .60 per bushel.
**3.** 40 bu. Pears @ .65 per bushel.
**4.** 25 bas. Plums @ .30 per basket.
**5.** 30 bxs. Oranges @ 3.25 per box.
**6.** 20 bxs. Lemons @ 3.90 per box.
**7.** 12 bxs. Limes @ .85 per box.
**8.** 15 bxs. Grapefruit @ 3.00 per box.
**9.** 10 bu. Crabapples @ 2.00 per bushel.
**10.** 12 crates Pineapples @ 3.00 per crate.
**11.** 10 bxs. Quinces @ 1.50 per box.
**12.** 20 bas. Prunes @ .20 per basket.
**13.** 45 bun. Bananas @ 1.25 per bunch.
**14.** 40 lbs. Apricots (evaporated) @ .15 per pound.
**15.** 48 bot. Olives @ 5.50 per dozen.
**16.** 10 cas. Figs @ 1.50 per case.
**17.** 10 bxs. Dates @ .30 per box.
**18.** 10 bxs. Raisins @ 4.50 per box.
**19.** 75 lbs. Almonds @ .15 per pound.
**20.** 60 lbs. Filberts @ .12 per pound.
**21.** 85 lbs. Pecans @ .10 per pound.
**22.** 80 lbs. Brazil Nuts @ .16 per pound.
**23.** 65 lbs. Eng. Walnuts @ .15 per pound.
**24.** 50 lbs. Black Walnuts @ .03 per pound.
**25.** 90 lbs. Peanuts @ .90 per pound.
**26.** 45 lbs. Chestnuts @ .08 per pound.
**27.** 35 lbs. Hickorynuts @ .05 per pound.
**28.** 250 Cocoanuts @ 5.00 per hundred.

**29.** Find the total cost of the 28 items.

## ORANGE PROBLEMS

**1.** Do you like oranges? At 3 for a dime how many can you buy with half a dollar?

Most of our oranges are grown in California or Florida.

**2.** Land on which oranges are raised is worth from $400 to $600 per acre. What is the cost of a 15 acre grove at $450 an acre?

**3.** When the trees are planted 20 feet apart, it requires 108 trees to plant an acre. How many trees are needed to plant a 15 acre grove?

**4.** Find their cost at $0.75 apiece.

Orange groves old enough to bear, are worth from $1,000 to $2,000 an acre. Three years after planting, a tree will produce one box of fruit; when 8 years old about 6 boxes; and when 15 years old, 10 boxes. Orange trees, 30 years old sometimes yield as much as 30 boxes a year.

**5.** If the total expense of raising a box of oranges is $2.10, and the selling price is $3.40, what is the profit on 120 boxes of oranges?

**6.** At this rate, the oranges on one tree, producing 10 boxes, is worth how much?

**7.** With 108 trees to an acre, at this rate the, profit per acre is how much?

**8.** Find the profit on 15 such acres.

**9.** The children in a certain school, after studying about oranges, made and sold some orange marmalade. Find the total expenses:

| | | | | | | |
|---|---|---|---|---|---|---|
| 6½ doz. | oranges | @ | $0.40 a doz. | 75 lbs. sugar | @ | 0.06 a lb. |
| 1½ " | lemons | @ | 0.42 a doz. | Jelly pasters | @ | 0.25 |
| ½ " | grape fruit | @ | 3 for 25 cts. | 6 lbs. of paraffin | @ | 0.50 |

### ORANGES

**10.** The glasses to hold the marmalade were given to the children. Their marmalade filled 16 dozen. How many glasses is this?

**11.** They sold the marmalade at $0.15 a jar, or $1.50 a dozen jars. How much cheaper than the regular price was the price per dozen?

**12.** Find their income from the sale of:
5 dozen glasses @ $1.50 a doz.
The remainder @ $0.15 a glass.

**13.** What did they earn from their marmalade?

### DRILLS FOR SPEED AND ACCURACY

A suggestion for Ex. XXV, Multiplication, p. 264.

Your teacher may read to you, or different ones in the class may give for the rest of you, several such problems as 26,872×3; 54,987×4; etc. The one who finishes first should call "One," the second, "Two," etc. See who finishes first the most times. Do this for several days. Then take Test Drill XXV.

### XXXI. Addition

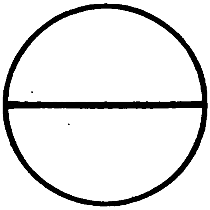
Add as if one-figure numbers, see 2, p. 193.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13 | 11 | 12 | 10 | 10 | 14 | 14 | 12 | 11 | 11 |
| 10 | 14 | 10 | 17 | 11 | 7 | 7 | 13 | 12 | 12 |
| 9 | 13 | 8 | 13 | 16 | 10 | 16 | 11 | 9 | 12 |
| 15 | 9 | 17 | 10 | 17 | 7 | 6 | 5 | 6 | 5 |

How does your record on Ex. XXXI, p. 266, compare with that of the other addition drills you have taken?

It is probably not necessary to outline this drill work further. Its nature having been indicated, and the material for use pointed out, the number of drills which may profitably be taken up by any one class is left for the teacher to determine.

### ONE-HALF AND EQUIVALENTS



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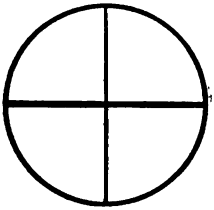

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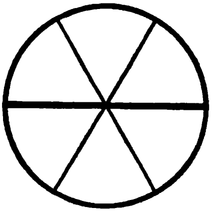


III

$\frac{1}{2}=\frac{?}{4}$ $\frac{1}{2}=\frac{?}{6}$

**1.** The first circle is divided into 2 halves. The second circle is divided into —.

**2.** Show $\frac{1}{2}$ of the first circle. Show $\frac{1}{2}$ of the second circle. It is the same as — fourths of the circle.

**3.** One-half = — fourths. $\frac{1}{2} = \frac{?}{4}$.

**4.** One-half pound is — fourths of a pound.

**5.** $\frac{1}{2}$ foot = $\frac{?}{4}$ of a foot.

**6.** Two fourths of a yard are the same as — of a yard.

**7.** $\frac{2}{4}$ dozen are the same as — dozen.

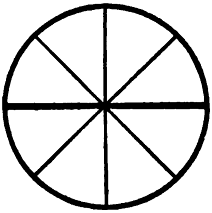
**8.** If you exchange a half dollar for fourths or quarters of a dollar you should receive — quarters. $\frac{1}{2} = \frac{2}{4}$.

**9.** The third circle is divided into — sixths.

**10.** Show $\frac{1}{2}$ of the circle. It contains — sixths of the circle.

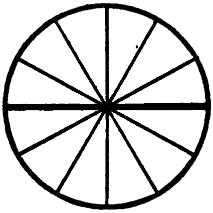
**11.** One half = $\frac{3}{?}$ $\frac{1}{2} = \frac{3}{?}$ **13.** $\frac{1}{2}$ foot = $\frac{?}{6}$ of a foot.
**12.** $\frac{1}{2}$ dozen = $\frac{?}{6}$ of a dozen **14.** $\frac{1}{2}$ yard = $\frac{?}{6}$ of a yard.

### ONE-HALF AND EQUIVALENTS



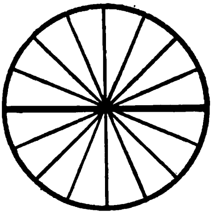
IV

$\frac{1}{2}=\frac{?}{8}$



V

$\frac{1}{2}=\frac{?}{12}$



VI

$\frac{1}{2}=\frac{?}{16}$

**15.** The fourth circle is divided into — eighths.

**16.** Show $\frac{1}{2}$ of the first circle. Show $\frac{1}{2}$ of the fourth circle. It is the same as — eighths of the circle.

**17.** One half = — eighths. $\frac{1}{2} = \frac{?}{8}$

**18.** The fifth circle is divided into — twelfths.

**19.** Show $\frac{1}{2}$ of the circle. It contains — twelfths of the circle.

**20.** One half = — twelfths. $\frac{1}{2} = \frac{6}{?}$.

**21.** 1 = $\frac{1}{12}$ dozen. $\frac{1}{2}$ dozen = $\frac{?}{12}$ dozen.

**22.** 1 inch = $\frac{1}{12}$ foot. $\frac{1}{2}$ foot = $\frac{?}{12}$ foot.

$$\frac{1}{2} = \frac{6}{12}$$

**23.** The sixth circle is divided into — sixteenths.

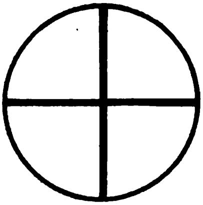
**24.** Find how many sixteenths of the circle in $\frac{1}{2}$ of it.

**25.** 1 oz. = $\frac{1}{16}$ of a pound. $\frac{1}{2}$ pound = $\frac{?}{16}$ of a pound.

$$\frac{1}{2} = \frac{8}{16}$$

### ONE-FOURTH AND EQUIVALENTS

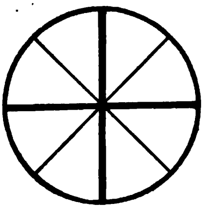
$\frac{1}{4}=\frac{?}{8}$ $\frac{1}{4}=\frac{?}{16}$ $\frac{1}{4}=\frac{?}{12}$



I

1. The first circle is marked off into fourths. The second is divided into — eighths.

2. Find $\frac{1}{4}$ of the first circle. Show $\frac{1}{8}$ of the second circle. In $\frac{1}{4}$ of the circle there are — eighths.

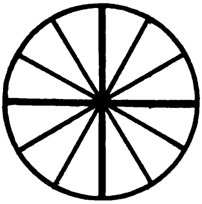


II

3. A pint = $\frac{1}{8}$ of a gallon. $\frac{1}{4}$ of a gallon is — eighths of a gallon.

4. $\frac{1}{4}$ of a bushel is — eighths of a bushel.

5. 1 quart = $\frac{1}{8}$ of a peck. $\frac{1}{4}$ of a peck = $\frac{?}{8}$ of a peck.



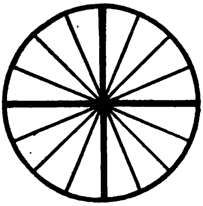
III

6. $\frac{1}{4}$ of a pound = $\frac{2}{?}$ of a pound.

$$\frac{1}{4}=\frac{2}{8}$$

7. Find $\frac{1}{4}$ of the first circle, then $\frac{1}{4}$ of the fourth.

8. Into how many sixteenths is the fourth circle divided?



IV

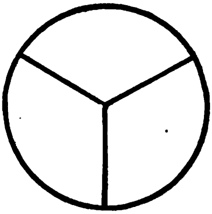
9. $\frac{1}{4}$ of the circle = $\frac{?}{16}$ of the circle.

10. 1 oz. = $\frac{1}{16}$ of a pound. $\frac{1}{4}$ of a pound = $\frac{?}{16}$ of a pound.

$$\frac{1}{4}=\frac{4}{16}$$

11. The third circle is marked off into — twelfths. ¼ of the circle contains — twelfths.

## ONE-THIRD AND EQUIVALENTS



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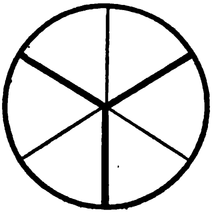
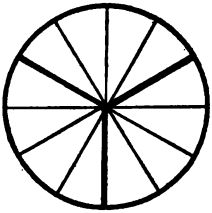


II



III

$$\frac{1}{3}=\frac{?}{6} \qquad \frac{1}{3}=\frac{?}{12}$$

1. The first circle is marked off into — thirds. The second circle is divided into — sixths. Look at $\frac{1}{3}$ of the first circle and then find $\frac{1}{3}$ of the second circle. It contains —?

2. $\frac{1}{3}$ of a foot $= \frac{?}{6}$ foot.

3. $\frac{1}{3}$ of a dozen $= \frac{?}{6}$ dozen.

4. $\frac{1}{3}$ of yard $= \frac{?}{6}$ yard.

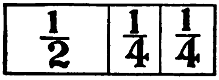
5. The third circle is divided into — twelfths. Look at $\frac{1}{3}$ of the first circle and then find $\frac{1}{3}$ of the third one. It contains — twelfths.

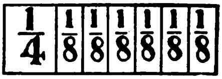
6. $\frac{1}{3}$ of a foot $= \frac{?}{12}$ foot. 7. $\frac{1}{3}$ of a yard $= \frac{?}{12}$ yard.

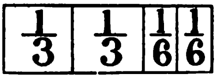
8. The second circle is divided into — sixths. The third circle is divided into — twelfths. Show $\frac{1}{6}$ of the second circle. Show $\frac{1}{6}$ of the third. It contains — of the circle.

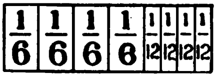
9. $\frac{1}{3}$ of 12 $=$ ?
10. $\frac{1}{3}$ of 24 $=$ ?
11. $\frac{1}{6} = \frac{?}{12}$
12. $\frac{2}{6}$ of 12 $=$ ?
13. $\frac{2}{6}$ of 24 $=$ ?
14. $\frac{1}{6}$ or $\frac{2}{12}$ of 24 $=$ ?

### A GAME OF PARTS









This game may be played by 2, 3 or 4 people. Each one first makes his own set of parts as follows:

1. Cut from light-weight cardboard 5 oblongs 6″ by 2″.

2. Very carefully rule 4 of them into parts and name as shown in the cut. Leave the first oblong uncut for a measure.

3. Cut along the lines you have drawn. Write your name or initials on the back of each slip.

4. Bring or make an envelope in which to keep your game. (For an envelope pattern, see p. 12.)

The game may be used in several ways.

I. Each player empties all the slips from his envelope into a common heap. Each in turn then quickly takes a slip until all are gone. When the last slip is taken, the players may begin building wholes from the slips they have drawn. The one who can first make 3 wholes from his parts, measures them with the uncut card in his set, and calls "Three Wholes."

II. Start as before. Have a time limit of from 2 to 4 minutes. The one who in this time has got the greatest number of equivalents for $\frac{1}{2}$ wins.

III. This way is something like "Authors." Each player, in turn, quickly draws 2 slips from the pile until he has taken 10. The rest are put into a box. The one who first fits all his parts into wholes, or is the first to make three wholes, wins. Besides the slips he has drawn, each player in turn may ask of any other player the slips he needs, giving in return an equivalent, thus $\frac{3}{12}$ for $\frac{2}{8}$; $\frac{1}{4}$ for $\frac{2}{8}$, etc.

## ADDING FRACTIONS

Solve the following orally:

**1.** Richard on his birthday received $\frac{1}{4}$ and $\frac{1}{2}$ of a dollar. Altogether he had $\frac{?}{4}$ of a dollar.

**2.** If I bought $\frac{1}{2}$ dozen buttons and then a quarter of a dozen of the same, what part of a dozen did I buy?

**3.** In the pantry there were $\frac{1}{2}$ of an apple pie and $\frac{1}{6}$ of a mince pie. Altogether there were $\frac{?}{6}$ of a pie.

**4.** A merchant sold $\frac{1}{3}$ of a sack of coffee and then $\frac{1}{4}$ of it. In all he sold $\frac{?}{12}$ of the sack.

**5.** Henry managed $\frac{1}{2}$ of a garden patch and his brother Charles managed $\frac{1}{3}$ of it. Altogether they managed $\frac{?}{6}$ of the patch.

**6.** Ruth cut a piece of ribbon $\frac{1}{4}$ yard long and then another piece $\frac{1}{3}$ of a yard in length. Altogether she cut $\frac{?}{12}$ of a yard.

**7.** There were $\frac{1}{3}$ dozen bananas left in a dish and $\frac{1}{4}$ dozen more in the pantry. Altogether there was what part of a dozen bananas?

**8.** John drew a line $\frac{1}{4}$ foot long, then made it $\frac{1}{6}$ of a foot longer. His line was — of a foot long.

**9.** $\frac{1}{2} + \frac{1}{4} = \frac{?}{8}$ $\quad \frac{1}{2} + \frac{1}{8} = \frac{?}{16}$ $\quad \frac{1}{2} + \frac{1}{4} = \frac{?}{16}$.

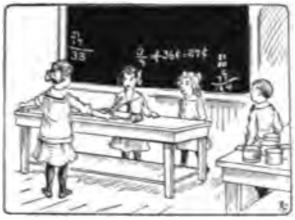
**10.** $\frac{1}{2} + \frac{1}{6} = \frac{?}{12}$ $\quad \frac{1}{2} + \frac{1}{8} = \frac{?}{8}$ $\quad \frac{1}{2} + \frac{1}{3} = ?$

**11.** $\frac{1}{3} + \frac{1}{4} = ?$ $\quad \frac{1}{3} + \frac{1}{6} = ?$ $\quad \frac{1}{3} + \frac{1}{12} = ?$

**12.** $\frac{1}{4} + \frac{1}{6} = ?$ $\quad \frac{1}{4} + \frac{1}{8} = ?$ $\quad \frac{1}{4} + \frac{1}{16} = ?$

Adding fractions by first reducing to a common denomination is not taken up as such until the fifth year. Only such parts are here given as may easily be combined if the pupils thoroughly know equivalent parts.

### Using the Fractional Part



Playing Ribbon Counter

Ask at the dry goods store for discarded ribbon bolts and use these long strips of paper for "ribbon" to stock a play store. The "clerks" may measure and cut the "ribbon" and make change for the "customers" with toy money. You may have the following sales among others:

1. $\frac{1}{2}$ yd. at $0.16. Change a quarter.
2. $\frac{5}{8}$ yd. at $0.18. Change 2 dimes.
3. $\frac{3}{8}$ yd. at $0.24. Change 2 dimes.
4. $\frac{2}{3}$ yd. at $0.30. Change a quarter.
5. $\frac{1}{8}$ yd. at $0.40. Change a quarter.
6. $\frac{1}{6}$ yd. at $0.30. Change a dime.
7. $\frac{3}{8}$ yd. at $0.16. Change a dime.
8. $\frac{3}{4}$ yd. at $0.36. Change 3 dimes.
9. $\frac{3}{8}$ yd. at $0.40. Change a quarter.

**10.** Ruth bought $2\frac{1}{4}$ yds. of ribbon for a sash and $\frac{7}{8}$ yds. for a hair ribbon. How much ribbon did she buy?

**11.** Helen used $\frac{1}{4}$ yd. of ribbon on a calendar and $1\frac{1}{8}$ yds. on a whisk broom holder. How many yards did she use altogether?

**12.** John's geography weighs $1\frac{1}{8}$ lbs., his reader $\frac{1}{2}$ lb. and his arithmetic $\frac{3}{8}$ lbs. How heavy are these books altogether in his book satchel?

**13.** Frank worked in the garden $1\frac{1}{4}$ hours on Monday, $1\frac{1}{2}$ hours on Wednesday, $\frac{3}{4}$ hours on Thurdsay, and 2 hours on Saturday. How many hours did he work?

## ADDING AND REDUCING FRACTIONS

Find the sums:

**1.** $\frac{1}{4} + \frac{5}{8} = ?$
**2.** $\frac{1}{2} + \frac{7}{12} = ?$
**3.** $\frac{3}{8} + \frac{1}{4} = ?$
**4.** $\frac{7}{12} + \frac{1}{6} = ?$
**5.** $\frac{1}{4} + \frac{7}{16} = ?$
**6.** $\frac{2}{3} + \frac{1}{6} = ?$
**7.** $\frac{1}{8} + \frac{3}{4} = ?$
**8.** $\frac{1}{6} + \frac{5}{12} = ?$
**9.** $\frac{9}{16} + \frac{1}{4} = ?$
**10.** $\frac{1}{2} + \frac{9}{16} = ?$
**11.** $\frac{1}{8} + \frac{13}{16} = ?$
**12.** $\frac{7}{16} + \frac{1}{2} = ?$
**13.** $\frac{1}{6} + \frac{5}{12} = ?$
**14.** $\frac{1}{4} + \frac{11}{16} = ?$
**15.** $\frac{3}{16} + \frac{1}{8} = ?$
**16.** $\frac{3}{4} + \frac{1}{6} = ?$
**17.** $\frac{1}{2} + \frac{1}{3} + \frac{5}{6} = \frac{?}{6}$.

Make the following reductions:

**1.** $\frac{1}{2} + \frac{3}{4} = \frac{?}{4}$. 1 dollar $= \frac{?}{4}$. If you have $\frac{5}{4}$ dollar that is 1 dollar and $\frac{?}{4}$ of a dollar besides.

**2.** $\frac{1}{2} + \frac{2}{3} = \frac{?}{6}$. 1 yard $= \frac{?}{6}$. $\frac{7}{6}$ yard is enough for — yard and $\frac{?}{6}$ over. Then $\frac{1}{2} + \frac{2}{3} = \frac{7}{6}$ or ?

**3.** $\frac{1}{2} + \frac{5}{6} = \frac{?}{6}$. $1 = \frac{?}{6}$. $\frac{7}{6} = 1\frac{?}{6}$. Then $\frac{1}{2} + \frac{5}{6} = \frac{?}{6}$ or ?

**4.** 1 apple = — halves. 1 dollar = — halves.

**5.** If you have $\frac{3}{2}$ of a dollar that is — dollar and $\frac{?}{?}$ half.

**6.** 1 yard $= \frac{?}{3}$ yard. $\frac{4}{3}$ yard is — yard and —.

**7.** $\frac{5}{3}$ yard $= 1\frac{?}{3}$ yard.

**8.** 1 dozen $= \frac{?}{6}$. $\frac{7}{6}$ dozen $= 1\frac{?}{6}$ dozen.

**9.** $\frac{15}{6}$ dozen $= 2\frac{?}{6}$ dozen. $\frac{17}{6}$ dozen $= 2\frac{?}{?}$ dozen.

**10.** 1 gallon $= \frac{?}{8}$ gallons. $\frac{9}{8}$ gallons $= 1\frac{?}{8}$ gallon.

**11.** $\frac{11}{8}$ gallon $= 1\frac{?}{?}$ gallon.

**12.** $\frac{13}{8}$ gallon $= \frac{?}{?}$ gallon.

## ADDING FRACTIONS

Make the following additions:

1. $\frac{3}{4} + \frac{2}{3} = \frac{?}{12}$
2. $\frac{5}{8} + \frac{9}{16} = \frac{?}{16}$
3. $\frac{2}{3} + \frac{5}{12} = \frac{?}{12}$
4. $\frac{3}{4} + \frac{5}{6} = \frac{?}{12}$
5. $\frac{5}{6} + \frac{11}{12} = \frac{?}{12}$
6. $\frac{7}{8} + \frac{5}{16} = \frac{?}{16}$
7. $\frac{5}{8} + \frac{3}{4} = \frac{?}{8}$
8. $\frac{2}{3} + \frac{5}{6} = \frac{?}{6}$
9. $\frac{3}{4} + \frac{7}{16} = \frac{?}{16}$
10. $\frac{7}{12} + \frac{2}{3} = \frac{?}{12}$

Add:

1. $\frac{3}{4} + \frac{1}{6} = \frac{?}{12}$
2. $\frac{2}{3} + \frac{1}{4} = \frac{?}{12}$
3. $\frac{3}{4} + \frac{2}{3} = ?$
4. $\frac{2}{3} + \frac{1}{2} = ?$
5. $\frac{7}{8} + \frac{1}{4} = ?$
6. $\frac{5}{6} + \frac{3}{4} = ?$
7. $\frac{3}{4} + \frac{1}{2} = ?$
8. $\frac{5}{6} + \frac{2}{3} = ?$
9. $\frac{2}{3} + \frac{5}{12} = ?$

## ADDITION OF MIXED NUMBERS

1. Betty Page, when $8\frac{1}{2}$ years old was $47\frac{1}{2}$ inches tall. During the next year she grew $2\frac{1}{6}$ inches. How tall was she then?

Average height for $8\frac{1}{2}$ years is $47\frac{7}{10}$ inches. Average increase is 2 inches. The children may be interested in comparing their own heights with the average.

2. $\begin{array}{r} 7\frac{1}{8} \\ \underline{9\frac{3}{8}} \end{array}$ 3. $\begin{array}{r} 8\frac{1}{4} \\ \underline{7\frac{1}{4}} \end{array}$ 4. $\begin{array}{r} 8\frac{5}{12} \\ \underline{5\frac{5}{12}} \end{array}$ 5. $\begin{array}{r} 12\frac{1}{3} \\ \underline{8\frac{1}{3}} \end{array}$ 6. $\begin{array}{r} 9\frac{3}{16} \\ \underline{4\frac{4}{16}} \end{array}$

7. $\begin{array}{r} 2\frac{1}{2} \\ \underline{3\frac{1}{4}} \end{array}$ 8. $\begin{array}{r} 3\frac{1}{4} \\ \underline{4\frac{1}{2}} \end{array}$ 9. $\begin{array}{r} 5\frac{1}{3} \\ \underline{6\frac{1}{6}} \end{array}$ 10. $\begin{array}{r} 4\frac{1}{8} \\ \underline{5\frac{9}{16}} \end{array}$ 11. $\begin{array}{r} 8\frac{5}{8} \\ \underline{3\frac{1}{4}} \end{array}$

12. $\begin{array}{r} 6\frac{1}{2} \\ \underline{8\frac{1}{4}} \end{array}$ 13. $\begin{array}{r} 9\frac{1}{6} \\ \underline{8\frac{1}{3}} \end{array}$ 14. $\begin{array}{r} 10\frac{1}{4} \\ \underline{7\frac{3}{8}} \end{array}$ 15. $\begin{array}{r} 6\frac{1}{2} \\ \underline{9\frac{1}{6}} \end{array}$ 16. $\begin{array}{r} 9\frac{3}{4} \\ \underline{7\frac{1}{8}} \end{array}$

17. $\begin{array}{r} 7\frac{3}{4} \\ \underline{4\frac{1}{8}} \end{array}$ 18. $\begin{array}{r} 5\frac{5}{8} \\ \underline{8\frac{1}{4}} \end{array}$ 19. $\begin{array}{r} 6\frac{1}{2} \\ \underline{7\frac{1}{6}} \end{array}$ 20. $\begin{array}{r} 5\frac{1}{4} \\ \underline{9\frac{3}{8}} \end{array}$ 21. $\begin{array}{r} 6\frac{3}{16} \\ \underline{8\frac{5}{8}} \end{array}$

22. $\begin{array}{r} 7\frac{2}{3} \\ \underline{5\frac{1}{6}} \end{array}$ 23. $\begin{array}{r} 8\frac{1}{4} \\ \underline{6\frac{5}{16}} \end{array}$ 24. $\begin{array}{r} 14\frac{1}{6} \\ \underline{2\frac{2}{3}} \end{array}$ 25. $\begin{array}{r} 18\frac{5}{16} \\ \underline{4\frac{1}{2}} \end{array}$ 26. $\begin{array}{r} 20\frac{2}{3} \\ \underline{4\frac{1}{6}} \end{array}$

## ADDITION OF MIXED NUMBERS

| | | | | |
|---|---|---|---|---|
| 1. $7\frac{1}{2}$<br>$5\frac{1}{4}$ | 2. $6\frac{1}{4}$<br>$4\frac{1}{4}$ | 3. $5\frac{1}{4}$<br>$3\frac{1}{8}$ | 4. $3\frac{3}{8}$<br>$2\frac{1}{4}$ | 5. $7\frac{1}{4}$<br>$5\frac{1}{2}$ |
| 6. $12\frac{1}{2}$<br>$8\frac{1}{4}$ | 7. $14\frac{1}{6}$<br>$7\frac{2}{3}$ | 8. $15\frac{3}{8}$<br>$5\frac{1}{2}$ | 9. $16\frac{2}{3}$<br>$6\frac{1}{6}$ | 10. $18\frac{1}{4}$<br>$8\frac{1}{2}$ |
| 11. $9\frac{1}{4}$<br>$5\frac{1}{2}$ | 12. $8\frac{1}{4}$<br>$6\frac{1}{4}$ | 13. $10\frac{1}{3}$<br>$4\frac{1}{3}$ | 14. $16\frac{1}{4}$<br>$10\frac{1}{2}$ | 16. $12\frac{2}{3}$<br>$7\frac{1}{6}$ |
| 16. $10\frac{2}{3}$<br>$6\frac{1}{6}$ | 17. $11\frac{1}{4}$<br>$10\frac{1}{2}$ | 18. $9\frac{1}{4}$<br>$5\frac{1}{2}$ | 19. $8\frac{3}{8}$<br>$6\frac{1}{2}$ | 20. $10\frac{3}{4}$<br>$8\frac{1}{8}$ |
| 21. $12\frac{3}{8}$<br>$5\frac{1}{2}$ | 22. $9\frac{3}{8}$<br>$9\frac{1}{4}$ | 23. $14\frac{2}{3}$<br>$6\frac{1}{6}$ | 24. $18\frac{1}{3}$<br>$7\frac{1}{6}$ | 25. $20\frac{1}{6}$<br>$12\frac{1}{3}$ |

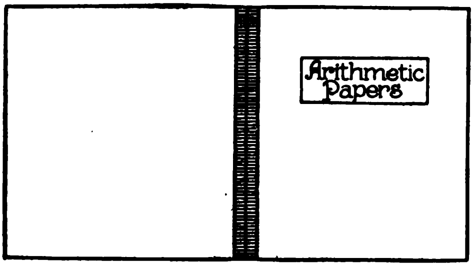
1. Figures show that the average American girl gains $4\frac{9}{10}$ pounds in the year between the ages of $8\frac{1}{2}$ and $9\frac{1}{2}$. If at $8\frac{1}{2}$ she weighs $52\frac{1}{2}$ lbs. what does she weigh a year later?[1]

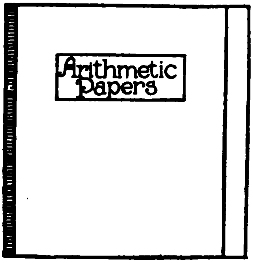
| | | | | |
|---|---|---|---|---|
| 2. $9\frac{1}{2}$<br>$7\frac{3}{8}$<br>$2\frac{1}{4}$<br>$5\frac{1}{8}$ | 3. $8\frac{1}{3}$<br>$5\frac{1}{6}$<br>$4\frac{5}{6}$<br>$6\frac{2}{3}$ | 4. $8\frac{5}{12}$<br>$5\frac{1}{2}$<br>$4\frac{1}{3}$<br>$3\frac{1}{12}$ | 5. $5\frac{1}{4}$<br>$2\frac{1}{8}$<br>$7\frac{3}{4}$<br>$9\frac{3}{8}$ | 6. $9\frac{7}{12}$<br>$2\frac{1}{3}$<br>$6\frac{2}{3}$<br>$1\frac{5}{12}$ |
| 7. $8\frac{1}{2}$<br>$7\frac{1}{6}$<br>$2\frac{1}{3}$<br>$5\frac{1}{2}$ | 8. $9\frac{3}{4}$<br>$7\frac{1}{8}$<br>$2\frac{1}{4}$<br>$8\frac{1}{2}$ | 9. $10\frac{3}{8}$<br>$6\frac{1}{16}$<br>$4\frac{3}{4}$<br>$5\frac{1}{8}$ | 10. $7\frac{1}{4}$<br>$9\frac{1}{2}$<br>$6\frac{5}{6}$<br>$5\frac{1}{4}$ | 11. $3\frac{2}{3}$<br>$9\frac{1}{2}$<br>$2\frac{1}{6}$<br>$7\frac{1}{6}$ |

---

[1] This problem introduces what is popularly termed "carrying" from the fractions to the units column. Let the children see it is just like all other "carrying" they have done in addition. See note p. 231. The addition is made by combining well-known parts to make wholes. Thus in 1: $\frac{3}{8}+\frac{1}{8}=\frac{1}{2}$. $\frac{1}{2}+\frac{1}{2}=1$. $1+\frac{1}{4}=1\frac{1}{4}$. This simple method is adequate for most problems in which fractions are to be added.

### A USEFUL PAPER HOLDER





Such a folder as this is a very good thing in which to keep your arithmetic, spelling, language or other loose papers. The front of the folder is not so wide as the back. This makes it easier to open. A strip of binder's linen is pasted along the crease on the back to prevent tearing. A very convenient size is that to fit paper 8½″ by 11″.

**1.** The front cover is to be ½″ wider than the 8½″ paper it holds. What is its width?

**2.** The back cover should extend ⅞″ beyond the edge of the 8½″ paper. What is its width?

**3.** How long a piece of paper is needed to make this folder?

**4.** How wide must it be to extend ¾″ at top and bottom beyond 11″ paper?

Lay the strip of paper as shown in the drawing. Draw the folding line on what will be the outside of your folder.

Crease from top to bottom along this line. Spread the folder out, the inside down.

**5.** How long a strip of binder's linen is needed to cover the crease?

**6.** The strip is 1″ wide. If folded so that the part on the front cover is ½″, how wide is that on the back cover?

## SUBTRACTION OF MIXED NUMBERS

1. The height of the average American boy at the age of $9\frac{1}{2}$ has been estimated to be $4\frac{1}{6}$ feet. Andrew J. who at $9\frac{1}{2}$ is $4\frac{1}{3}$ feet tall is what part of a foot taller than the average boy of his age.

| | | | | |
|---|---|---|---|---|
| 2. $16\frac{3}{4}$<br>$9\frac{1}{4}$ | 3. $17\frac{1}{2}$<br>$8\frac{1}{2}$ | 4. $10\frac{2}{3}$<br>$4\frac{1}{3}$ | 5. $8\frac{5}{6}$<br>$2\frac{1}{6}$ | 6. $17\frac{7}{12}$<br>$9\frac{5}{12}$ |
| 7. $7\frac{1}{2}$<br>$5\frac{1}{4}$ | 8. $5\frac{1}{4}$<br>$3\frac{1}{8}$ | 9. $12\frac{1}{2}$<br>$5\frac{1}{4}$ | 10. $18\frac{1}{3}$<br>$7\frac{1}{6}$ | 11. $9\frac{1}{2}$<br>$4\frac{1}{8}$ |
| 12. $3\frac{3}{8}$<br>$2\frac{1}{4}$ | 13. $15\frac{7}{8}$<br>$5\frac{1}{2}$ | 14. $14\frac{5}{6}$<br>$7\frac{2}{3}$ | 15. $16\frac{2}{3}$<br>$6\frac{1}{6}$ | 16. $18\frac{3}{4}$<br>$8\frac{1}{2}$ |
| 17. $12\frac{2}{3}$<br>$7\frac{1}{6}$ | 18. $16\frac{3}{4}$<br>$10\frac{1}{2}$ | 19. $8\frac{5}{8}$<br>$6\frac{1}{2}$ | 20. $9\frac{3}{4}$<br>$5\frac{1}{8}$ | 21. $12\frac{5}{6}$<br>$5\frac{1}{12}$ |
| 22. $9\frac{3}{4}$<br>$4\frac{2}{3}$ | 23. $10\frac{5}{6}$<br>$8\frac{2}{3}$ | 24. $16\frac{7}{8}$<br>$8\frac{3}{4}$ | 25. $10\frac{15}{16}$<br>$6\frac{3}{4}$ | 26. $9\frac{5}{6}$<br>$5\frac{3}{4}$ |

## WHEN THERE IS NO FRACTION IN THE MINUEND

56 What do we take from the one's column.[1] This leaves
$32\frac{3}{4}$ — ones? Finish the problem.

| | | | | | |
|---|---|---|---|---|---|
| 1. 29<br>$16\frac{1}{4}$ | 2. 36<br>$25\frac{3}{4}$ | 3. 29<br>$15\frac{5}{6}$ | 4. 79<br>$18\frac{3}{8}$ | 5. 69<br>$17\frac{3}{4}$ | 6. 87<br>$16\frac{5}{6}$ |
| 7. 99<br>$27\frac{2}{3}$ | 8. 77<br>$45\frac{3}{4}$ | 9. 65<br>$51\frac{5}{6}$ | 10. 48<br>$35\frac{1}{8}$ | 11. 26<br>$12\frac{1}{3}$ | 12. 45<br>$33\frac{1}{2}$ |
| 13. 47<br>$35\frac{1}{2}$ | 14. 65<br>$43\frac{1}{3}$ | 15. 74<br>$52\frac{1}{4}$ | 16. 86<br>$44\frac{1}{5}$ | 17. 64<br>$32\frac{1}{6}$ | 18. 55<br>$22\frac{1}{7}$ |

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[1] The children's previous experience in subtraction of integers enables them to see that in this case they take a whole from the units column from which to subtract the fraction in the subtrahend.

### WHEN THE FRACTION IN THE SUBTRAHEND IS THE LARGER

**1.** It has been estimated that the weight of the average American boy $9\frac{1}{2}$ years old is $59\frac{6}{10}$ pounds. Robert B. weighed $62\frac{1}{10}$ pounds at this age. How much heavier was he than the average?[1]

$$\begin{array}{r} 62\frac{1}{10} \\ \underline{59\frac{6}{10}} \end{array}$$

There is no larger fraction in the minuend from which we can take the $\frac{6}{10}$. But there are 2 ones in one's column.

We can take 1 of them leaving — ones. $\frac{6}{10}$ from 1 = ?

Can you finish the problem?[1]

**2.** $\begin{array}{r} 26\frac{1}{4} \\ \underline{14\frac{1}{2}} \end{array}$ **3.** $\begin{array}{r} 34\frac{1}{4} \\ \underline{12\frac{1}{2}} \end{array}$ **4.** $\begin{array}{r} 45\frac{1}{4} \\ \underline{21\frac{1}{2}} \end{array}$ **5.** $\begin{array}{r} 37\frac{1}{8} \\ \underline{14\frac{1}{2}} \end{array}$ **6.** $\begin{array}{r} 25\frac{1}{8} \\ \underline{22\frac{1}{2}} \end{array}$ **7.** $\begin{array}{r} 49\frac{1}{8} \\ \underline{36\frac{1}{2}} \end{array}$

**8.** $\begin{array}{r} 57\frac{1}{8} \\ \underline{36\frac{1}{2}} \end{array}$ **9.** $\begin{array}{r} 64\frac{1}{4} \\ \underline{23\frac{1}{2}} \end{array}$ **10.** $\begin{array}{r} 89\frac{1}{8} \\ \underline{72\frac{1}{2}} \end{array}$ **11.** $\begin{array}{r} 68\frac{1}{6} \\ \underline{42\frac{1}{2}} \end{array}$ **12.** $\begin{array}{r} 75\frac{1}{6} \\ \underline{33\frac{1}{2}} \end{array}$ **13.** $\begin{array}{r} 27\frac{1}{6} \\ \underline{14\frac{1}{2}} \end{array}$

**14.** $\begin{array}{r} 89\frac{1}{4} \\ \underline{65\frac{1}{2}} \end{array}$ **15.** $\begin{array}{r} 47\frac{1}{8} \\ \underline{24\frac{1}{2}} \end{array}$ **16.** $\begin{array}{r} 63\frac{1}{6} \\ \underline{41\frac{1}{2}} \end{array}$ **17.** $\begin{array}{r} 98\frac{1}{4} \\ \underline{67\frac{3}{4}} \end{array}$ **18.** $\begin{array}{r} 74\frac{1}{4} \\ \underline{52\frac{3}{4}} \end{array}$ **19.** $\begin{array}{r} 39\frac{1}{4} \\ \underline{22\frac{3}{4}} \end{array}$

**20.** $\begin{array}{r} 26\frac{1}{2} \\ \underline{13\frac{3}{4}} \end{array}$ **21.** $\begin{array}{r} 45\frac{1}{2} \\ \underline{21\frac{3}{4}} \end{array}$ **22.** $\begin{array}{r} 93\frac{1}{2} \\ \underline{31\frac{3}{4}} \end{array}$ **23.** $\begin{array}{r} 69\frac{1}{2} \\ \underline{46\frac{3}{4}} \end{array}$ **24.** $\begin{array}{r} 47\frac{1}{4} \\ \underline{25\frac{3}{4}} \end{array}$ **25.** $\begin{array}{r} 96\frac{1}{2} \\ \underline{53\frac{3}{4}} \end{array}$

**26.** $\begin{array}{r} 36\frac{1}{6} \\ \underline{14\frac{2}{3}} \end{array}$ **27.** $\begin{array}{r} 79\frac{1}{6} \\ \underline{43\frac{1}{3}} \end{array}$ **28.** $\begin{array}{r} 62\frac{1}{6} \\ \underline{21\frac{1}{2}} \end{array}$ **29.** $\begin{array}{r} 84\frac{1}{6} \\ \underline{33\frac{5}{6}} \end{array}$ **30.** $\begin{array}{r} 55\frac{1}{6} \\ \underline{41\frac{2}{3}} \end{array}$ **31.** $\begin{array}{r} 96\frac{1}{6} \\ \underline{65\frac{1}{3}} \end{array}$

**32.** $\begin{array}{r} 69\frac{3}{8} \\ \underline{46\frac{5}{8}} \end{array}$ **33.** $\begin{array}{r} 85\frac{1}{8} \\ \underline{53\frac{7}{8}} \end{array}$ **34.** $\begin{array}{r} 77\frac{3}{8} \\ \underline{45\frac{7}{8}} \end{array}$ **35.** $\begin{array}{r} 58\frac{1}{8} \\ \underline{34\frac{1}{2}} \end{array}$ **36.** $\begin{array}{r} 75\frac{1}{8} \\ \underline{52\frac{1}{2}} \end{array}$ **37.** $\begin{array}{r} 88\frac{3}{8} \\ \underline{71\frac{1}{2}} \end{array}$

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[1] This kind of problem is just like those preceding except that when the fraction in the subtrahend has been subtracted from the whole unit the fraction in the minuend must be added to the result.

This method is usually shorter than adding the 1 and the minuend fraction, changing them to an improper fraction of the same denomination as the subtrahend fraction, and then performing the subtraction.

### WHEN THE FRACTION IN THE SUBTRAHEND IS THE LARGER[1]

$$\begin{array}{rrrrrrrrrrrr}
1. & 70 & 2. & 80 & 3. & 40 & 4. & 30 & 5. & 90 & 6. & 60 \\
 & \underline{52\frac{1}{2}} & & \underline{65\frac{3}{4}} & & \underline{37\frac{1}{2}} & & \underline{24\frac{1}{2}} & & \underline{72\frac{3}{4}} & & \underline{49\frac{3}{4}} \\
7. & 61\frac{1}{4} & 8. & 73\frac{1}{2} & 9. & 42\frac{1}{4} & 10. & 54\frac{1}{2} & 11. & 63\frac{1}{8} & 12. & 72\frac{1}{8} \\
 & \underline{27\frac{1}{2}} & & \underline{16\frac{3}{4}} & & \underline{23\frac{3}{4}} & & \underline{17\frac{3}{4}} & & \underline{24\frac{1}{2}} & & \underline{35\frac{1}{2}}
\end{array}$$

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[1] These problems differ from the others only in that the last digit of the subtrahend is larger than that in the minuend.

### PROBLEMS FOR ORAL SOLUTION

**1.** If I buy 2 yards of velvet, and use only three-eighths of a yard, what part of a yard do I have left?

**2.** If five-sixths of a farm is planted with grain, and the rest of it is used for pasture, what part of it is used for pasture?

**3.** Mary and her sister Louise together sewed $12\frac{1}{2}$ yards of carpet. Mary sewed $5\frac{3}{4}$ yards. How many yards did Louise sew?

**4.** A family ate at dinner three-fourths of a blackberry pie, and two-thirds of a huckleberry pie. What part of the blackberry pie was left? Of the huckleberry pie? What part of a pie was left altogether?

Make other problems using:

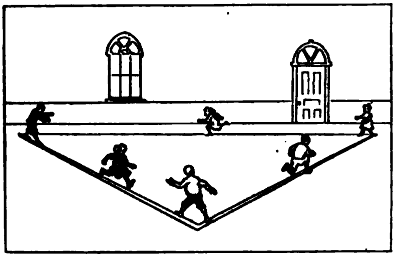
**1.** $\frac{5}{6} - \frac{1}{2}$
**2.** $\frac{1}{2} - \frac{1}{4}$
**3.** $\frac{3}{4} - \frac{1}{2}$
**4.** $\frac{7}{12} - \frac{1}{6}$
**5.** $\frac{2}{3} - \frac{1}{6}$
**6.** $\frac{3}{4} - \frac{1}{8}$

**Test Problems:**

$$\begin{array}{rrrrrrrrrr}
1. & 94\frac{1}{4} & 2. & 36\frac{1}{8} & 3. & 74\frac{1}{6} & 4. & 85\frac{1}{4} & 5. & 60\frac{1}{2} \\
 & \underline{71\frac{1}{2}} & & \underline{25\frac{1}{2}} & & \underline{32\frac{1}{2}} & & \underline{43\frac{3}{4}} & & \underline{23\frac{3}{4}}
\end{array}$$

**6.** $75\frac{1}{6} - 22\frac{1}{3}$. **7.** $57\frac{1}{3} - 45\frac{1}{2}$ **8.** $64\frac{1}{8} - 35\frac{1}{4}$.

## PRACTICE PROBLEMS IN FRACTIONS



The sidewalk in front of a certain school is laid out in the form of a triangle. At recess the children use it as a track for relay races.

**Make clear the nature of a relay race, if the children are not already familiar with it. Let them have some such races themselves to supply data for more problems.**

**1.** Which of the following was the winning team if each child ran his share as shown:

I. Hazel, 1 min.; Robert $\frac{7}{8}$ min.; Victor $\frac{3}{4}$ min.
II. Glenn $1\frac{1}{8}$ min.; Betty $\frac{3}{4}$ min.; James 1 min.

**2.** By how much did the victors win?

**3.** Another time the children chose 2 teams of 6, each child running $\frac{2}{3}$ of the distance around the triangle for his part. Which team won?

I. Marion 1 min.; Grace $\frac{7}{8}$ min.; Warren $\frac{7}{8}$ min.; Charles 1 min.; Edna $\frac{3}{4}$ min.; Mabel $\frac{3}{4}$ min.

II. Josephine $\frac{7}{8}$ min.; Herbert $\frac{3}{4}$ min.; Frank $\frac{3}{4}$ min.; Richard $\frac{3}{4}$ min.; Julia 1 min; Edwin $\frac{3}{4}$ min.

**4.** By how much was the winning team ahead?

**5.** These children have school $2\frac{3}{4}$ hours in the morning and $2\frac{1}{4}$ hours in the afternoon. Their time at school is how much longer or shorter than yours?

**6.** On Wednesday they have $1\frac{1}{3}$ hours for Manual or Domestic Arts; $\frac{1}{2}$ hour for Music and $\frac{2}{3}$ hours for English. These studies altogether occupy — hours.

## PRACTICE PROBLEMS IN FRACTIONS[1]

**7.** This leaves how much time for their other work?

**8.** Every day they have $\frac{1}{2}$ hour for playground or gymnastic work. How much time each week is this?

**9.** The doors open 15 minutes before the tardy bell in the morning and the afternoon. What part of an hour is given for study or special help each day before school?

**10.** Find how many hours it amounts to in a school week. Is it worth using for study or reading?

More problems based on the data of their own program will be of interest here.

These children have oral spelling 4 days a week. They keep a record of their places in the line and figure out their weekly average. They add these averages to find their month's standing in Oral Spelling.

**11.** Find which of the following has the best record:

| | Richard | Raymond | Betty | Eugene |
|---|---|---|---|---|
| 1st week's average | $4\frac{1}{2}$ | $10\frac{1}{4}$ | 5 | 12 |
| 2nd " " | $5\frac{1}{4}$ | $12\frac{1}{2}$ | $3\frac{1}{2}$ | $16\frac{1}{2}$ |
| 3rd " " | 3 | $14\frac{1}{4}$ | $6\frac{3}{4}$ | $15\frac{1}{4}$ |
| 4th " " | $6\frac{1}{2}$ | $8\frac{1}{2}$ | $4\frac{1}{2}$ | $10\frac{1}{2}$ |
| Total | | | | |

**12.** Which should receive the better grade, the ones with large totals, or those with small? Why?

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[1] In keeping with the idea that the children's interests and activities furnish the most valuable of their number experiences, the problems on these pages have been selected with the aim of suggesting activities which may be worked out in almost any schoolroom in correlation with the arithmetic.

### PRACTICE PROBLEMS IN FRACTIONS

**13.** How much nearer the head has the winner's average place been than that of the three others?

You will find it will be worth your time to work out your spelling in this way for several weeks if you have never tried it. Besides furnishing valuable local data for problems it motivates the work in spelling. Such correlation of interest is desirable.

**14.** These children have been learning to space their letters in Penmanship. They allow $\frac{1}{4}$ inch for each letter or how much for a 4 letter word? How much for a 5 letter word? A 6 letter word? An 8 letter word?

**15.** They leave $\frac{1}{4}$ inch "aisle" between the "rows" of words, and margins at the right and left edges, as the spacing permits. A 7 letter word and the following "aisle" take how much room?

**16.** A 6 letter word and the "aisle" following occupy how much space?

**17.** How many inches are needed for the $\frac{3}{4}$ inch left hand margin, the first word of 5 letters and $\frac{1}{4}$ inch for the first "aisle?"

One day the children were given paper $8\frac{1}{2}$ inches wide and told to plan the spacing for a page, using any one of the following words:—time, quince, quantity, queen.

You may choose any one and plan the first line. These questions will help:

**18.** How many $\frac{1}{4}$ inches wide is my paper?

**19.** How many $\frac{1}{4}$ inches wide is each word?

**20.** With the "aisle," each one is how long?

**21.** How many can I get on one line still leaving some space for margins?

### PRACTICE PROBLEMS IN FRACTIONS

**21.** How shall I divide that margin space to make it look best?

If you do not have this work in your penmanship let the children plan these pages using lines to represent the words, thus:

For a 4 letter word

For a 6 letter word

If these children waste time, a record is kept, and when they have wasted 15 minutes all who have kept the class waiting make this time up after school. If they do not waste more than 5 minutes a week, that week's record is erased.

**22.** The first week they tried this plan, the time wasted was as follows: $2\frac{1}{2}$ min.; $2\frac{1}{4}$ min.; $1\frac{1}{2}$ min.; $\frac{3}{4}$ min.; 2 min.; $1\frac{1}{2}$ min.; $1\frac{3}{4}$ min.; $\frac{1}{2}$ min.; $1\frac{1}{4}$ min.; $\frac{3}{4}$ min.; $1\frac{1}{4}$ min. Did they have to make up time after school or not that week?

**23.** The second week they wasted time as follows. How much time was this: $1\frac{1}{2}$ min.; $\frac{3}{4}$ min.; $\frac{1}{2}$ min.; $1\frac{1}{4}$ min.; $\frac{1}{2}$ min.; $\frac{1}{2}$ min.

**24.** How much less time did they waste the second week than the first?

**25.** In the first Fire Drill of the term it was $3\frac{1}{2}$ minutes before every child in this school was out of the building. In the second practice all were out in $2\frac{3}{4}$ minutes. How much less time did it take in the second drill?

**26.** If later, they learned to get out in $1\frac{7}{8}$ minutes how much less time did they take than in the first drill?

An experiment of this sort with your own class may surprise you, as well as furnish data for some more problems.

**27.** The 5A children helped drill the 5B's for a spelling match. They worked before and after school as follows: $\frac{1}{3}$ hr., $\frac{1}{4}$ hr., $\frac{1}{6}$ hr., $\frac{1}{4}$ hr., $\frac{1}{3}$ hr., $\frac{1}{2}$ hr. How much extra practice did they get?

## ADDING AND SUBTRACTING MIXED NUMBERS

Add:

| **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|
| $247\frac{1}{2}$ | $324$ | $490\frac{3}{8}$ | $620\frac{1}{6}$ | $596\frac{1}{8}$ |
| $122$ | $671\frac{3}{4}$ | $87\frac{1}{2}$ | $215\frac{2}{3}$ | $210\frac{3}{4}$ |
| $39\frac{1}{6}$ | $93\frac{1}{4}$ | $115\frac{3}{4}$ | $528\frac{1}{2}$ | $132\frac{1}{2}$ |
| $480\frac{1}{3}$ | $215$ | $219$ | $49$ | $409\frac{3}{8}$ |
| $213$ | $450\frac{1}{2}$ | $627\frac{1}{8}$ | $268\frac{1}{3}$ | $87\frac{1}{4}$ |

| **6.** | **7.** | **8.** | **9.** | **10.** |
|---|---|---|---|---|
| $876\frac{1}{2}$ | $711$ | $816\frac{7}{8}$ | $972\frac{2}{3}$ | $311\frac{3}{8}$ |
| $439\frac{1}{3}$ | $43\frac{3}{4}$ | $205\frac{1}{8}$ | $425\frac{1}{6}$ | $219\frac{1}{8}$ |
| $217$ | $111\frac{1}{2}$ | $211\frac{1}{4}$ | $714$ | $784\frac{3}{4}$ |
| $131\frac{1}{6}$ | $516$ | $119\frac{3}{4}$ | $523\frac{1}{2}$ | $926\frac{1}{2}$ |

Subtract:

| **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|
| $324\frac{3}{4}$ | $906\frac{1}{2}$ | $634$ | $907\frac{7}{8}$ | $368\frac{1}{6}$ |
| $121\frac{1}{4}$ | $412\frac{1}{4}$ | $43\frac{2}{3}$ | $218\frac{1}{2}$ | $207\frac{1}{3}$ |

| **6.** | **7.** | **8.** | **9.** | **10.** |
|---|---|---|---|---|
| $483$ | $621\frac{3}{8}$ | $840\frac{5}{7}$ | $531\frac{2}{3}$ | $478$ |
| $211\frac{1}{3}$ | $116\frac{1}{2}$ | $163$ | $100\frac{1}{6}$ | $297\frac{3}{8}$ |

| **11.** | **12.** | **13.** | **14.** | **15.** |
|---|---|---|---|---|
| $972\frac{1}{6}$ | $516\frac{1}{8}$ | $211\frac{3}{8}$ | $406\frac{3}{4}$ | $626\frac{1}{2}$ |
| $781\frac{2}{3}$ | $39\frac{3}{4}$ | $91\frac{3}{4}$ | $245\frac{1}{8}$ | $75\frac{7}{8}$ |

| **16.** | **17.** | **18.** | **19.** | **20.** |
|---|---|---|---|---|
| $862$ | $496\frac{1}{9}$ | $356\frac{1}{3}$ | $462\frac{1}{5}$ | $671\frac{1}{12}$ |
| $641\frac{1}{8}$ | $121$ | $120\frac{1}{6}$ | $207\frac{3}{10}$ | $419\frac{1}{6}$ |

| **21.** | **22.** | **23.** | **24.** | **25.** |
|---|---|---|---|---|
| $392\frac{1}{5}$ | $546\frac{1}{8}$ | $487$ | $632\frac{1}{4}$ | $728\frac{2}{9}$ |
| $240\frac{2}{5}$ | $324\frac{3}{8}$ | $321\frac{1}{9}$ | $501\frac{1}{2}$ | $486\frac{5}{9}$ |

## PRACTICE DRILL PROBLEMS

Multiply these numbers:

1. $\$8.20 \times 2\frac{3}{4}$
2. $6.40 \times 3\frac{1}{4}$
3. $7.65 \times 4\frac{1}{5}$
4. $5.45 \times 6\frac{2}{5}$
5. $8.80 \times 7\frac{1}{8}$
6. $9.60 \times 5\frac{1}{6}$
7. $\$4.97 \times 3\frac{1}{7}$
8. $8.19 \times 5\frac{2}{3}$
9. $6.25 \times 8\frac{2}{5}$
10. $5.67 \times 6\frac{2}{7}$
11. $9.68 \times 7\frac{3}{8}$
12. $7.38 \times 4\frac{5}{6}$
13. $\$9.18 \times 6\frac{2}{3}$
14. $4.16 \times 9\frac{3}{4}$
15. $7.15 \times 7\frac{3}{5}$
16. $5.94 \times 6\frac{1}{6}$
17. $3.36 \times 5\frac{1}{8}$
18. $8.37 \times 4\frac{2}{9}$

Find the products of these numbers:

1. $925 \times 72\frac{3}{5}$
2. $636 \times 55\frac{1}{6}$
3. $749 \times 65\frac{2}{7}$
4. $432 \times 37\frac{3}{8}$
5. $549 \times 43\frac{2}{9}$
6. $815 \times 91\frac{2}{5}$
7. $387 \times 33\frac{2}{3}$
8. $558 \times 45\frac{1}{9}$
9. $750 \times 54\frac{5}{6}$
10. $432 \times 73\frac{3}{4}$
11. $625 \times 37\frac{2}{5}$
12. $824 \times 43\frac{1}{8}$
13. $295 \times 79\frac{3}{5}$
14. $567 \times 38\frac{2}{7}$
15. $736 \times 46\frac{1}{8}$
16. $432 \times 57\frac{5}{6}$
17. $352 \times 63\frac{3}{4}$
18. $963 \times 81\frac{2}{9}$

Multiply:

1. $245\frac{1}{2} \times 8$
2. $372\frac{1}{3} \times 9$
3. $568\frac{1}{5} \times 5$
4. $732\frac{1}{6} \times 6$
5. $615\frac{3}{4} \times 4$
6. $823\frac{2}{7} \times 7$
7. $469\frac{3}{4} \times 8$
8. $713\frac{3}{5} \times 5$
9. $514\frac{2}{3} \times 6$
10. $815\frac{5}{7} \times 7$
11. $423\frac{7}{9} \times 9$
12. $919\frac{2}{3} \times 3$
13. $387\frac{1}{7} \times 7$
14. $839\frac{2}{5} \times 5$
15. $762\frac{1}{4} \times 8$
16. $438\frac{2}{9} \times 9$
17. $345\frac{3}{4} \times 4$
18. $935\frac{3}{5} \times 5$

Find the products:

1. $728\frac{2}{5} \times 15$
2. $639\frac{1}{9} \times 27$
3. $541\frac{3}{8} \times 24$
4. $863\frac{5}{7} \times 21$
5. $387\frac{2}{3} \times 36$
6. $915\frac{5}{6} \times 42$
7. $389\frac{6}{7} \times 63$
8. $472\frac{1}{2} \times 46$
9. $718\frac{3}{4} \times 72$
10. $638\frac{2}{7} \times 56$
11. $921\frac{5}{9} \times 81$
12. $854\frac{1}{6} \times 48$
13. $298\frac{7}{8} \times 24$
14. $561\frac{1}{3} \times 45$
15. $823\frac{2}{9} \times 36$
16. $347\frac{3}{5} \times 45$
17. $724\frac{3}{7} \times 63$
18. $917\frac{3}{8} \times 72$

## REVIEW PRACTICE PROBLEMS

I. Find the sum of the numbers in Problems 1, 2, 3.

II. Subtract the numbers in Problems 4 to 12, as indicated.

III. Multiply the numbers in Problems 13 to 34 successively by 15, by 25, by 60.

IV. Divide the numbers in Problems 35 to 56 successively by 12, by 16, by 48.

**1.** 57875
43759
61943
50687
69538
42419
85368

**2.** 63295
98614
57321
79432
36584
83947
64139

**3.** 59872
42391
76318
62497
93211
81397
74983
52418

**4.** 57875
43759

**5.** 61943
50687

**6.** 69538
42419

**7.** 85368
63295

**8.** 98614
57321

**9.** 79432
36584

**10.** 83947
64139

**11.** 59872
42391

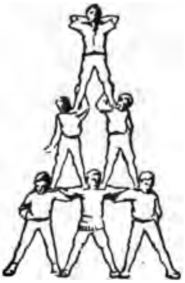
**12.** 76318
62497

**13.** 57875
**14.** 95734
**15.** 34916
**16.** 78605
**17.** 83596
**18.** 91424
**19.** 86358
**20.** 59236
**21.** 41689
**22.** 12375
**23.** 23497
**24.** 48563
**25.** 74938
**26.** 93146
**27.** 27895
**28.** 19324
**29.** 81367
**30.** 78426
**31.** 11239
**32.** 79318
**33.** 38947
**34.** 81425

**35.** 27312
**36.** 40560
**37.** 54336
**38.** 59632
**39.** 71136
**40.** 76512
**41.** 78288
**42.** 83472
**43.** 88320
**44.** 92928
**45.** 94656
**46.** 79488
**47.** 81120
**48.** 82656
**49.** 73056
**50.** 66768
**51.** 68400
**52.** 81264
**53.** 35616
**54.** 45168
**55.** 61968
**56.** 89856

Write from dictation the numbers in columns 3 and 4. Fourth Grade pupils should not be required to add columns of this extent, but *drill in copying figures in column form,* affords valuable training.

### ORAL AND WRITTEN



**1.** How many boys are there in this athletic pyramid? How many fingers have they all? How many fingers and toes? If each boy has 208 bones, how many bones have they all?

**2.** In the story of Gulliver, the men of Brob-ding-nag were so tall that one of their steps would measure 10 yards. How many feet were there in a step?

**3.** Jack the Giant Killer, in ancient legend, dug a pit 120 feet wide, for the giant to fall into. How many yards wide was the pit?

**4.** If I write a telegram of 9 words, and cancel 3 that are found to be unnecessary, and then add 4 more, how many words are there?

**5.** If Rip Van Winkle, in the old story, awoke from his sleep in the mountains in 1792, after he had slept for 20 years, in what year did he go to sleep?

**6.** General Washington became our first President in 1789. How long had he been President when Rip Van Winkle awoke from his long sleep, according to the story?

**7.** At a certain station a passenger train of 7 coaches leaves a dining coach and 2 day coaches, and takes on 3 through sleeping coaches and a private car. How many coaches has it then?

**8.** If for 10 weeks I deposit in a savings bank $3.00 each week, and then for 10 months I pay $2.00 each week to a building and loan association, how much money do I save in all this time?

## MISCELLANEOUS REVIEW PROBLEMS

**9.** Robert earned $\frac{3}{4}$ of a dollar each day for 4 days. How many dollars did he earn?

**10.** Three gallons of milk will fill how many milk jars that hold $\frac{1}{2}$ of a gallon each?

**11.** William worked $\frac{1}{3}$ of each day for 12 days. How many days' time did he work in all?

**12.** Joe owned $\frac{3}{4}$ of a flock of sheep, and sold $\frac{1}{3}$ of what he owned. What part of the flock did he sell?

**13.** Harvey paid $\frac{1}{6}$ of a dollar apiece for 9 lunches at a restaurant. How many dollars did he pay for them?

**14.** If $\frac{5}{6}$ of a farm is planted with grain, and the rest of it is used for pasture, what part of it is used for pasture?

**15.** Ella passed $\frac{1}{4}$ of a year in the city each year for 6 years. How many years' time in all did she pass in the city?

**16.** A woman buys 2 barrels of flour and uses $\frac{2}{3}$ of the whole amount. What part of the second barrel does she use?

**17.** A railway train lost $\frac{1}{6}$ of its schedule time on each of four trips. What part of its schedule time for a trip did it lose in all?

**18.** John raised $3\frac{1}{4}$ bushels of beans, and Fred raised $2\frac{1}{3}$ bushels. How many bushels of beans did they raise in all?

**19.** If Mrs. Jones' watch, starting right, gains $1\frac{1}{2}$ minutes a day for 10 days, and is then set back 20 minutes, how much too slow is it then?

### ORAL AND WRITTEN

**20.** If your shoe is 8 inches long, how many shoe lengths will measure exactly 10 feet?

**21.** If your pulse beats 70 times in one minute, how long does it require to beat 4900 times?

**22.** A grocer bought 40 bushels of onions. They weighed 1900 pounds. What did each bushel weigh?

**23.** Six bushels of sweet potatoes were found to weigh 330 pounds. What did each peck weigh?

**24.** A pole 40 feet long is set in the ground 6 feet deep. How tall is the pole above the ground?

**25.** A merchant sold 120 bottles of olive oil, each containing one quart. How many gallons did he sell?

**26.** There is a garden 100 feet long and 50 feet wide. What length of fence is required to inclose it?

**27.** Another garden, having twice the length of this, has but half the width. What length of fence is required to inclose it?

**28.** A certain Percheron horse weighs eighteen hundred pounds. A certain African elephant weighs three times as much. What does it weigh?

**29.** If a railway train travels at the rate of 48 miles an hour, how many miles does it go in 5 minutes?—in ten minutes?—in one minute?

**30.** A mischievous bluejay carried away from a barn 2 staples, 4 harness buckles, 4 nails, 7 screws, and 3 small bundles of seeds, hiding them in 4 places. How many articles did it hide in each place, if they were divided equally?

### MISCELLANEOUS REVIEW PROBLEMS

**31.** A furniture dealer bought a table for $12.00, and sold it for $\frac{1}{3}$ more. What did he sell it for?

**32.** If he had sold it for $\frac{1}{3}$ less than he paid for it, how many dollars would he have lost?

**33.** If an American flag is 78 inches wide, how many inches wide is each stripe? How many feet wide is the flag?

**34.** If the posts of a fence are 6 feet apart, how many will be needed to fence a piece of ground 36 feet square? Draw a square figure of the ground, and mark the posts.

**35.** There are 5280 feet in a mile. If your school building is $\frac{1}{4}$ of a mile from your home, how many steps of 2 feet each will you take in going to school and returning?

**36.** If a Boy Scout does seven good deeds a day for eleven days, and on two occasions three of these are balanced by three demerits each time, how many deeds has he to his credit?

**37.** Mr. Jones divided $6.60 among 3 boys for extra work in his store. One boy received $\frac{1}{2}$ of the whole amount. Another $\frac{1}{4}$ of the whole amount. How much did the third boy receive?

**38.** A spring is 100 feet from a summer cottage in the mountains, and water has to be carried from it in buckets to the cottage. In carrying the water 3 times a day for 7 days, how many hundred feet does the cottager have to walk?

## WORK IN ADDITION

The "*Reserve Problems*" on this and the three succeeding pages are so arranged and placed as to be easily available for special drill, for review or for test purposes, and may be assigned by the teacher in small or large sections as the need suggests.

Add the numbers in the following columns up and then test the work by adding them down.

**1.** 505
234
196

**2.** 721
235
296

**3.** 634
482
721

**4.** 390
248
590

**5.** 287
325
570
685

**6.** 563
428
916
207

**7.** 380
264
626
194

**8.** 847
231
820
497

**9.** 472
583
619
784
621

**10.** 728
649
391
816
205

**11.** 521
715
413
290
879

**12.** 492
560
238
714
329

**13.** 220
142
432
814
397
424

**14.** 131
270
384
290
725
618

**15.** 314
201
835
415
617
911

**16.** 511
162
314
462
525
916

**17.** 862
298
721
532
628

**18.** 890
725
432
920
529

**19.** 462
729
386
319
526

**20.** 921
648
394
863
917

**21.** 22
38
69
35
48
91
70
46
27
82
36
51
60

**22.** 62
51
19
17
26
38
72
55
40
19
34
35
41

**23.** 2861
3972
5648
7241
5862
9135
4321
3994

**24.** 5214
3921
2461
3982
2817
5628
4280
6287

**25.** 4296
5385
6490
5328
8269
7481
8316
4689

### WORK IN SUBTRACTION

**1.-5.** From 100000 subtract respectively, 99999, 88888, 77777, 66666 and 55555.

**6.-19.** Subtract 39, 73 and 85 from each of these numbers: 482, 782, 693, 541, 816, 139.

**20.-39.** Subtract 291, 384 and 419 from each of these numbers: 703, 643, 527, 811, 514, 936.

**40.-59.** Subtract 1432, 2354 and 3572 from each of these numbers: 4765, 6437, 5362, 3874, 7583.

Write and subtract:

| | | | | | |
|---|---|---|---|---|---|
| **60.-65.** | $476.85 | $396.78 | $538.45 | $635.67 | $732.57 |
| | 238.60 | 214.89 | 350.72 | 456.78 | 614.38 |

| | | | | |
|---|---|---|---|---|
| **66.-70.** | $56874.37 | $43796.54 | $67235.95 | $39654.40 |
| | 38795.08 | 25687.35 | 43854.36 | 21785.25 |

**71.-75.**
832 − 624
538 − 517
972 − 546
638 − 546
729 − 645

**76.-80.**
3947 − 2385
4621 − 3746
5941 − 4879
8392 − 6587
9273 − 7988

**81.-85.**
26391 − 14768
45462 − 33827
57105 − 46296
39547 − 27388
18621 − 14937

**86.-90.**
354315 − 263637
215196 − 124239
436251 − 352078
628531 − 546683
547215 − 478379

**91.-95.**
487 − 369
593 − 478
783 − 694
372 − 365
924 − 785
633 − 512
725 − 285
817 − 620

**96.-100.**
6381 − 4574
7253 − 5467
4672 − 4353
5864 − 5498
8549 − 7635
5219 − 3875
6135 − 3941
6948 − 5873

**101.-106.**
64115 − 52798
47324 − 35967
75938 − 62746
93745 − 83572
65473 − 74358
58637 − 47853
72239 − 61972
86491 − 54786

**107.-111.**
635263 − 624725
519386 − 435097
738465 − 564872
659378 − 427963
862947 − 714685
586394 − 394863
758235 − 628547
685729 − 586492

### WORK IN MULTIPLICATION

#### I

1. 156 × 23
2. 271 × 36
3. 182 × 42
4. 354 × 28
5. 279 × 55
6. 324 × 47
7. 462 × 29
8. 325 × 68
9. 296 × 72
10. 451 × 35
11. 385 × 42
12. 624 × 56
13. 385 × 64
14. 280 × 57
15. 496 × 45
16. 379 × 37
17. 524 × 73
18. 287 × 96
19. 349 × 82
20. 465 × 94
21. 329 × 87
22. 548 × 73
23. 287 × 69
24. 453 × 74
25. 642 × 77
26. 524 × 49
27. 389 × 67
28. 471 × 93
29. 722 × 68
30. 394 × 87

#### II

1. 23469 × 31
2. 47932 × 42
3. 68745 × 17
4. 92861 × 45
5. 63512 × 56
6. 39862 × 71
7. 63514 × 82
8. 49328 × 93
9. 76485 × 65
10. 18962 × 67
11. 49723 × 59
12. 89611 × 38
13. 77322 × 64
14. 47896 × 85
15. 99620 × 57
16. 43821 × 94
17. 19375 × 83
18. 82713 × 47
19. 61309 × 33
20. 85460 × 55
21. 38924 × 87
22. 65117 × 92
23. 91590 × 86
24. 45609 × 91
25. 82431 × 78
26. 14960 × 35
27. 21236 × 31
28. 58940 × 46
29. 39641 × 52
30. 32871 × 78

#### III

1. 262 × 128
2. 254 × 236
3. 146 × 282
4. 354 × 128
5. 216 × 205
6. 390 × 158
7. 422 × 214
8. 378 × 146
9. 249 × 218
10. 316 × 172
11. 452 × 230
12. 514 × 315
13. 382 × 296
14. 415 × 379
15. 297 × 184
16. 532 × 319
17. 279 × 197
18. 653 × 298
19. 718 × 495
20. 628 × 515
21. 822 × 425
22. 691 × 372
23. 546 × 287
24. 726 × 549
25. 484 × 375
26. 576 × 496
27. 628 × 540
28. 396 × 247
29. 862 × 519
30. 549 × 417

### WORK IN DIVISION

Divide, by short division, the number in each column by the numbers at the top of the column, giving the quotient and the remainder, if any.

| (6,8) | (3,9) | (4,7) | (3,5) | (3,7) |
|---|---|---|---|---|
| **1.-18.** 72 | **19.-36.** 54 | **37.-54.** 56 | **55.-72.** 60 | **73.-90.** 63 |
| 84 | 72 | 84 | 75 | 84 |
| 96 | 81 | 112 | 90 | 105 |
| 55 | 75 | 125 | 100 | 110 |
| 144 | 135 | 140 | 135 | 126 |
| 216 | 162 | 168 | 180 | 189 |
| 252 | 216 | 196 | 225 | 252 |
| 288 | 243 | 224 | 450 | 315 |
| 165 | 225 | 250 | 500 | 330 |

Divide by long division, giving the quotient and remainder, if any. Prove by multiplying the divisor by the quotient.

| **1.-15.** | **16.-30.** | **31.-45.** | **46.-60.** |
|---|---|---|---|
| 49178 ÷ 32 | 66240 ÷ 35 | 4389 ÷ 228 | 14828 ÷ 721 |
| 61396 ÷ 61 | 75108 ÷ 59 | 8152 ÷ 429 | 21736 ÷ 832 |
| 59218 ÷ 84 | 47925 ÷ 95 | 3139 ÷ 146 | 25232 ÷ 912 |
| 72135 ÷ 45 | 63422 ÷ 62 | 7072 ÷ 312 | 22454 ÷ 763 |
| 40386 ÷ 73 | 78319 ÷ 48 | 8341 ÷ 515 | 37476 ÷ 864 |
| 91485 ÷ 55 | 82112 ÷ 76 | 8778 ÷ 336 | 29082 ÷ 999 |
| 87916 ÷ 38 | 35980 ÷ 65 | 6634 ÷ 248 | 31501 ÷ 981 |
| 65391 ÷ 62 | 43628 ÷ 39 | 8928 ÷ 628 | 38430 ÷ 735 |
| 77932 ÷ 56 | 82531 ÷ 97 | 8281 ÷ 546 | 48118 ÷ 784 |
| 58406 ÷ 63 | 96492 ÷ 66 | 7257 ÷ 320 | 14205 ÷ 315 |
| 88415 ÷ 85 | 45652 ÷ 55 | 7659 ÷ 185 | 17920 ÷ 320 |
| 51062 ÷ 33 | 35514 ÷ 53 | 8996 ÷ 468 | 22506 ÷ 221 |
| 76180 ÷ 75 | 47743 ÷ 62 | 5517 ÷ 615 | 24495 ÷ 345 |
| 83915 ÷ 65 | 54817 ÷ 87 | 7071 ÷ 416 | 22750 ÷ 350 |
| 21836 ÷ 93 | 66425 ÷ 92 | 6055 ÷ 549 | 25369 ÷ 352 |

# EXERCISES FOR PRACTICE

in

## ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

The following Exercises for Practice have been arranged to assist pupils to develop accuracy and speed in the fundamental operations. Pupils should practice until they can **correctly** work every example in each exercise within the time limit prescribed for each grade in the following table:

| Grade | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|
| Number of minutes required to work each exercise | 3¼ | 2¾ | 2¼ | 2 | 1¾ | |

## Suggestions to Teachers

The best results can be secured if the exercises are hektographed or mimeographed so that the pupils can do the work directly on the paper with the examples. By this method the teacher can vary the order of the examples and thus prevent the mere memorizing of answers by the pupils. The exercises may be copied by the pupils occasionally in order to train them in writing examples in good form. In a school with a print shop, the pupils can print these exercises for the teacher.

Every exercise should be accurately timed with a watch.

These exercises may be used in two ways:

(1) The whole class may work on the same exercise. The pupils should exchange papers and correct them as the teacher reads the answers. Each pupil should keep a record of his results in each exercise.

(2) All pupils may begin with Exercise I. Pupils who finish all the examples in Exercise I correctly may go on with Exercise II at the next practice, and so on. Those who fail on any exercise must repeat it until they can do it correctly within the time limit. Have the papers collected, because it would take too much time for the teacher to read the answers to so many different exercises. The teacher may appoint some reliable pupil to assist her in checking these practice exercises. This second plan recognizes and provides means for meeting individual differences in pupils.

[1] These exercises were arranged by Charles L. Spain, Assistant Superintendent of Schools, Detroit, Mich.

### I. Addition

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 9 | 7 | 6 | 2 | 3 | 5 | 1 | 4 | 9 | 5 | 5 |
| 7 | 1 | 2 | 3 | 1 | 7 | 9 | 0 | 7 | 4 | 4 | 6 |
| 7 | 7 | 3 | 3 | 8 | 7 | 2 | 4 | 9 | 2 | 9 | 2 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 9 | 5 | 7 | 2 | 1 | 6 | 1 | 6 | 3 | 3 | 8 |
| 7 | 6 | 0 | 7 | 8 | 4 | 4 | 9 | 5 | 2 | 6 | 6 |
| 5 | 9 | 7 | 8 | 7 | 6 | 0 | 9 | 2 | 6 | 4 | 8 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 9 | 5 | 1 | 1 | 4 | 9 | 4 | 9 | 2 | 4 | 4 |
| 4 | 5 | 1 | 5 | 8 | 3 | 3 | 1 | 7 | 7 | 0 | 5 |
| 3 | 3 | 0 | 7 | 2 | 4 | 1 | 0 | 6 | 3 | 5 | 2 |

### II. Subtraction

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 56 | 98 | 77 | 19 | 34 | 76 | 58 | 49 | 46 | 49 | 65 |
| 6 | 4 | 7 | 5 | 7 | 4 | 5 | 8 | 3 | 4 | 5 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 56 | 75 | 97 | 88 | 49 | 83 | 66 | 99 | 89 | 67 | 28 | 35 |
| 3 | 4 | 6 | 5 | 7 | 2 | 6 | 1 | 5 | 5 | 4 | 3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 76 | 83 | 72 | 56 | 67 | 43 | 59 | 66 | 55 | 69 |
| 2 | 2 | 1 | 2 | 5 | 7 | 3 | 9 | 5 | 5 | 4 |

### III. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 7 | 4 | 1 | 2 | 2 | 5 | 7 | 5 | 3 |
| 0 | 2 | 4 | 9 | 1 | 4 | 0 | 1 | 4 | 9 |
| 1 | 3 | 3 | 3 | 8 | 5 | 1 | 3 | 0 | 5 |
| 3 | 2 | 5 | 0 | 2 | 1 | 1 | 2 | 1 | 8 |
| 6 | 5 | 8 | 3 | 2 | 6 | 7 | 8 | 1 | 8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | 2 | 6 | 6 | 7 | 8 | 1 | 3 | 1 |
| 1 | 6 | 1 | 0 | 9 | 8 | 7 | 5 | 1 |
| 9 | 5 | 4 | 4 | 8 | 6 | 2 | 8 | 7 |
| 0 | 4 | 8 | 9 | 6 | 7 | 2 | 3 | 1 |
| 1 | 6 | 6 | 9 | 5 | 5 | 9 | 3 | 8 |

## IV. Addition

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 55 | 31 | 47 | 24 | 14 | 24 | 32 | 70 |
| 32 | 48 | 51 | 62 | 15 | 33 | 36 | 18 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 17 | 43 | 20 | 20 | 26 | 81 | 42 | 22 |
| 72 | 21 | 13 | 50 | 73 | 13 | 27 | 16 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 48 | 33 | 52 | 75 | 32 | 17 | 12 | 26 |
| 31 | 33 | 41 | 21 | 23 | 62 | 26 | 51 |

## V. Multiplication

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 25 | 46 | 58 | 94 | 87 | 53 | 85 | 67 | 26 | 49 |
| 2 | 3 | 7 | 5 | 6 | 7 | 4 | 8 | 9 | 5 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24 | 19 | 28 | 91 | 87 | 39 | 83 | 16 | 54 | 57 |
| 4 | 2 | 5 | 3 | 7 | 4 | 9 | 7 | 6 | 3 |

## VI. Addition

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 32 | 24 | 31 | 25 | 70 | 42 | 50 | 36 |
| 16 | 13 | 22 | 33 | 17 | 31 | 30 | 20 |
| 31 | 62 | 11 | 10 | 11 | 15 | 19 | 32 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | 42 | 25 | 52 | 17 | 10 | 23 | 50 |
| 19 | 13 | 20 | 15 | 51 | 55 | 61 | 16 |
| 30 | 22 | 42 | 12 | 20 | 32 | 14 | 12 |

## VII. Subtraction

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 57 | 79 | 32 | 61 | 89 | 75 | 78 | 39 | 48 | 59 | 35 |
| 27 | 34 | 25 | 21 | 20 | 55 | 60 | 18 | 22 | 36 | 54 | 15 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | 52 | 76 | 53 | 67 | 31 | 44 | 89 | 74 | 42 | 80 | 33 |
| 31 | 41 | 74 | 33 | 20 | 11 | 22 | 67 | 53 | 32 | 50 | 21 |

## VIII. Division

8)48 7)56 9)81 5)45 7)84 4)36 7)63 6)54

5)55 8)56 9)63 7)35 6)60 9)90 4)36 9)45

4)20 7)42 7)70 9)36 8)40 5)35 6)36 6)48

9)99 8)64 9)54 9)27 3)24 6)42 6)66 8)80

7)77 6)72 5)50 3)21 7)28 4)40 5)40 5)25

4)24 3)27 8)96 4)48 3)33 3)30 6)24 8)32

5)15 6)18 7)28 3)36 4)44 2)22 4)16

## IX. Addition

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 63 | 48 | 37 | 67 | 38 | 59 | 62 | 67 | 42 |
| 17 | 27 | 13 | 15 | 26 | 32 | 25 | 18 | 26 | 29 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 49 | 17 | 36 | 27 | 35 | 64 | 34 | 39 | 55 | 24 |
| 42 | 55 | 15 | 54 | 25 | 26 | 48 | 22 | 18 | 28 |

## X. Addition

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | 7 | 6 | 9 | 9 | 7 | 1 |
| 3 | 5 | 1 | 4 | 5 | 7 | 1 |
| 5 | 4 | 3 | 8 | 7 | 0 | 1 |
| 1 | 7 | 4 | 5 | 9 | 4 | 0 |
| 5 | 6 | 9 | 6 | 6 | 9 | 7 |
| 7 | 8 | 6 | 9 | 1 | 3 | 8 |
| 7 | 3 | 4 | 1 | 7 | 7 | 9 |

| | | | | | |
|---|---|---|---|---|---|
| 4 | 6 | 9 | 6 | 6 | 4 |
| 4 | 4 | 6 | 4 | 7 | 5 |
| 1 | 2 | 4 | 7 | 9 | 1 |
| 1 | 9 | 8 | 8 | 7 | 8 |
| 6 | 7 | 2 | 8 | 7 | 6 |
| 6 | 5 | 5 | 5 | 5 | 7 |
| 7 | 2 | 7 | 9 | 4 | 8 |

## XI. Subtraction

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 56 | 39 | 51 | 45 | 75 | 31 | 92 | 99 |
| 48 | 28 | 43 | 32 | 54 | 17 | 67 | 75 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 76 | 92 | 29 | 68 | 57 | 44 | 87 | 46 |
| 25 | 58 | 16 | 49 | 16 | 36 | 68 | 23 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21 | 74 | 46 | 88 | 62 | 53 | 77 | 55 |
| 19 | 35 | 12 | 69 | 22 | 34 | 24 | 51 |

## XII. Addition

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 6 | 5 | 4 | 1 | 3 | 2 | 5 |
| 3 | 4 | 4 | 1 | 2 | 7 | 5 | 1 |
| 2 | 4 | 7 | 5 | 3 | 2 | 3 | 9 |
| 1 | 1 | 3 | 7 | 9 | 7 | 5 | 7 |
| 4 | 4 | 3 | 3 | 7 | 8 | 1 | 6 |
| 1 | 4 | 2 | 2 | 8 | 4 | 4 | 7 |
| 2 | 2 | 5 | 6 | 5 | 2 | 2 | 5 |
| 5 | 6 | 3 | 4 | 2 | 6 | 3 | 3 |
| 3 | 2 | 2 | 4 | 3 | 3 | 6 | 1 |

## XIII. Multiplication

| | | | | | |
|---|---|---|---|---|---|
| 158 | 572 | 327 | 689 | 215 | 379 |
| 4 | 7 | 9 | 3 | 8 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| 427 | 526 | 917 | 669 | 537 | 329 |
| 3 | 5 | 4 | 2 | 8 | 8 |

## XIV. Addition

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 75 | 77 | 85 | 96 | 56 | 89 | 66 | 47 |
| 38 | 35 | 39 | 34 | 79 | 46 | 54 | 95 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37 | 46 | 26 | 35 | 32 | 58 | 96 | 34 |
| 85 | 68 | 75 | 77 | 99 | 47 | 45 | 77 |

## XV. Division

| | | |
|---|---|---|
| $23\overline{)598}$ | $17\overline{)306}$ | $72\overline{)864}$ |
| $38\overline{)456}$ | $35\overline{)735}$ | $27\overline{)729}$ |

## XVI. Addition

| | | | | | | |
|---|---|---|---|---|---|---|
| 58 | 15 | 18 | 22 | 16 | 12 | 52 |
| 19 | 13 | 47 | 29 | 11 | 25 | 29 |
| $\underline{20}$ | $\underline{32}$ | $\underline{20}$ | $\underline{20}$ | $\underline{66}$ | $\underline{37}$ | $\underline{14}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 28 | 50 | 40 | 26 | 25 | 13 | 14 |
| 22 | 29 | 37 | 17 | 34 | 22 | 28 |
| $\underline{27}$ | $\underline{17}$ | $\underline{14}$ | $\underline{36}$ | $\underline{14}$ | $\underline{35}$ | $\underline{42}$ |

## XVII. Subtraction

| | | | | | | |
|---|---|---|---|---|---|---|
| 63 | 41 | 74 | 63 | 81 | 70 | 84 |
| $\underline{27}$ | $\underline{25}$ | $\underline{36}$ | $\underline{19}$ | $\underline{17}$ | $\underline{29}$ | $\underline{45}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 30 | 43 | 78 | 55 | 42 | 63 | 57 |
| $\underline{22}$ | $\underline{39}$ | $\underline{49}$ | $\underline{37}$ | $\underline{17}$ | $\underline{44}$ | $\underline{48}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 48 | 41 | 64 | 47 | 40 | 22 | 53 |
| $\underline{39}$ | $\underline{33}$ | $\underline{56}$ | $\underline{38}$ | $\underline{39}$ | $\underline{15}$ | $\underline{44}$ |

## XVIII. Addition

| | | | | | |
|---|---|---|---|---|---|
| 22 | 69 | 35 | 61 | 75 | 37 |
| 29 | 41 | 36 | 54 | 37 | 54 |
| 70 | 50 | 57 | 37 | 22 | 71 |

| | | | | | |
|---|---|---|---|---|---|
| 67 | 27 | 53 | 37 | 90 | 31 |
| 43 | 22 | 75 | 25 | 79 | 57 |
| 51 | 95 | 27 | 87 | 88 | 68 |

## XIX. Multiplication

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 48 | 57 | 72 | 85 | 92 | 83 | 50 | 76 |
| 30 | 40 | 50 | 20 | 60 | 70 | 80 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 84 | 35 | 48 | 53 | 71 | 38 | 93 |
| 90 | 60 | 40 | 80 | 90 | 20 | 30 |

## XX. Addition

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 38 | 67 | 32 | 21 | 36 | 30 | 74 | 72 |
| 64 | 57 | 54 | 43 | 29 | 63 | 44 | 78 |
| 34 | 43 | 76 | 97 | 60 | 75 | 61 | 51 |
| 78 | 86 | 89 | 66 | 83 | 27 | 20 | 65 |
| 95 | 95 | 54 | 10 | 40 | 81 | 57 | 36 |

## XXI. Division

| | | | | |
|---|---|---|---|---|
| 2)430 | 5)895 | 3)171 | 2)642 | 5)325 |
| 6)474 | 9)756 | 4)372 | 2)198 | 8)472 |
| 3)522 | 9)468 | 7)259 | 3)147 | 6)888 |

## XXII. Addition

| | | | | |
|---|---|---|---|---|
| 111<br>222 | 635<br>340 | 326<br>362 | 784<br>215 | 869<br>120 |
| 362<br>425 | 441<br>236 | 150<br>228 | 655<br>132 | 252<br>525 |
| 631<br>225 | 725<br>262 | 795<br>203 | 438<br>351 | 651<br>325 |
| 521<br>420 | 573<br>315 | 435<br>323 | 726<br>252 | 522<br>175 |

## XXIII. Subtraction

| | | | | |
|---|---|---|---|---|
| 745<br>48 | 473<br>51 | 763<br>86 | 394<br>62 | 223<br>58 |
| 624<br>55 | 250<br>30 | 415<br>97 | 432<br>21 | 848<br>59 |
| 421<br>38 | 555<br>35 | 317<br>58 | 590<br>60 | 500<br>73 |

## XXIV. Addition

| | | | | | | |
|---|---|---|---|---|---|---|
| 127 | 423 | 377 | 265 | 188 | 177 | 509 |
| 346 | 369 | 208 | 127 | 506 | 718 | 306 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 223 | 351 | 746 | 462 | 119 | 227 | 148 |
| 547 | 329 | 136 | 228 | 239 | 136 | 226 |

## XXV. Multiplication

| | | | |
|---|---|---|---|
| 427 | 342 | 872 | 951 |
| 12 | 27 | 36 | 27 |

## XXVI. Addition

| | | | | | |
|---|---|---|---|---|---|
| 368 | 556 | 274 | 775 | 456 | 515 |
| 457 | 256 | 169 | 137 | 359 | 387 |

| | | | | | |
|---|---|---|---|---|---|
| 448 | 374 | 556 | 271 | 664 | 457 |
| 452 | 459 | 368 | 579 | 236 | 353 |

## XXVII. Subtraction

| | | | | | |
|---|---|---|---|---|---|
| 678 | 465 | 546 | 388 | 394 | 189 |
| 354 | 123 | 124 | 235 | 181 | 145 |

| | | | | | |
|---|---|---|---|---|---|
| 857 | 311 | 385 | 618 | 621 | 785 |
| 640 | 200 | 352 | 303 | 611 | 463 |

| | | | | |
|---|---|---|---|---|
| 157 | 141 | 383 | 468 | 124 |
| 133 | 120 | 202 | 357 | 114 |

## XXVIII. Addition

| | | | | | |
|---|---|---|---|---|---|
| 34 | 73 | 29 | 19 | 22 | 25 |
| 23 | 29 | 28 | 77 | 43 | 72 |
| 26 | 93 | 35 | 81 | 46 | 84 |
| 11 | 58 | 15 | 52 | 24 | 20 |
| 53 | 54 | 93 | 51 | 70 | 12 |
| 17 | 13 | 20 | 30 | 83 | 64 |
| 56 | 16 | 47 | 48 | 21 | 27 |

## XXIX. Division

| | | | |
|---|---|---|---|
| 20)600 | 30)900 | 40)120 | 50)550 |
| 70)490 | 60)300 | 80)240 | 20)800 |
| 40)280 | 70)630 | 60)420 | 80)400 |
| 30)270 | 80)480 | 80)640 | 50)250 |
| 20)140 | 90)810 | 70)350 | 20)120 |
| 50)700 | 70)280 | 50)300 | 60)660 |
| 80)800 | 90)630 | | 50)750 |

## XXX. Subtraction

| | | | | |
|---|---|---|---|---|
| 579<br>445 | 856<br>587 | 634<br>312 | 755<br>557 | 384<br>272 |
| 227<br>105 | 883<br>595 | 359<br>244 | 472<br>186 | 786<br>555 |
| 449<br>228 | 200<br>185 | 326<br>222 | 791<br>693 | 327<br>207 |

## XXXI. Addition

$$\begin{array}{rrrrr}
34 & 42 & 85 & 69 & 86 \\
17 & 88 & 24 & 83 & 35 \\
91 & 89 & 55 & 14 & 43 \\
63 & 28 & 67 & 22 & 33 \\
49 & 29 & 95 & 47 & 56 \\
30 & 44 & 70 & 98 & 67 \\
62 & 20 & 85 & 73 & 35 \\
74 & 88 & 60 & 25 & 20 \\
\underline{83} & \underline{92} & \underline{37} & \underline{40} & \underline{45}
\end{array}$$

## XXXII. Addition

$$\begin{array}{rrrrr}
764 & 843 & 597 & 634 & 488 \\
\underline{886} & \underline{568} & \underline{488} & \underline{397} & \underline{536}
\end{array}$$

$$\begin{array}{rrrrr}
927 & 848 & 368 & 456 & 543 \\
\underline{384} & \underline{153} & \underline{645} & \underline{844} & \underline{567}
\end{array}$$

## XXXIII. Multiplication

$$\begin{array}{rr}
452 & 147 \\
\underline{121} & \underline{362}
\end{array}$$

$$\begin{array}{r}
572 \\
\underline{251}
\end{array}$$

## XXXIV. Addition

| | | | | | |
|---|---|---|---|---|---|
| 288 | 167 | 472 | 144 | 263 | 321 |
| 326 | 221 | 149 | 186 | 175 | 490 |
| 281 | 482 | 201 | 214 | 199 | 129 |

| | | |
|---|---|---|
| 161 | 255 | 221 |
| 185 | 245 | 178 |
| 127 | 105 | 102 |

## XXXV. Division

89)8722

84)7644

37)2442

21)2625

84)6804

## XXXVI. Addition

| | | | |
|---|---|---|---|
| 645 | 524 | 249 | 626 |
| 256 | 190 | 462 | 257 |
| 192 | 309 | 318 | 199 |

| | | | |
|---|---|---|---|
| 488 | 676 | 507 | 496 |
| 262 | 166 | 345 | 605 |
| 413 | 234 | 159 | 619 |

## XXXVII. Subtraction

$$\begin{array}{r}753\\\underline{386}\end{array}\qquad\begin{array}{r}228\\\underline{169}\end{array}\qquad\begin{array}{r}374\\\underline{185}\end{array}\qquad\begin{array}{r}783\\\underline{299}\end{array}\qquad\begin{array}{r}831\\\underline{564}\end{array}$$

$$\begin{array}{r}823\\\underline{337}\end{array}\qquad\begin{array}{r}912\\\underline{864}\end{array}\qquad\begin{array}{r}973\\\underline{699}\end{array}\qquad\begin{array}{r}211\\\underline{186}\end{array}\qquad\begin{array}{r}243\\\underline{178}\end{array}$$

$$\begin{array}{r}433\\\underline{277}\end{array}\qquad\begin{array}{r}741\\\underline{666}\end{array}\qquad\begin{array}{r}256\\\underline{167}\end{array}\qquad\begin{array}{r}555\\\underline{478}\end{array}$$

## XXXVIII. Addition

$$\begin{array}{r}971\\783\\111\\888\\\underline{438}\end{array}\qquad\begin{array}{r}456\\326\\411\\600\\\underline{812}\end{array}\qquad\begin{array}{r}998\\875\\502\\751\\\underline{209}\end{array}\qquad\begin{array}{r}878\\717\\616\\135\\\underline{802}\end{array}\qquad\begin{array}{r}246\\202\\115\\494\\\underline{787}\end{array}\qquad\begin{array}{r}751\\344\\561\\228\\\underline{794}\end{array}$$

## XXXIX. Multiplication

$$\begin{array}{r}2344\\\underline{689}\end{array}\qquad\qquad\begin{array}{r}3271\\\underline{422}\end{array}$$

$$\begin{array}{r}688\\\underline{75}\end{array}$$

## XL. Addition

422
567
895
361
227
426
772

492
835
976
524
327
831
991

555
122
263
962
165
447
887

862
545
535
262
213
991
104

## XLI. Division

$72\overline{)16992}$

$33\overline{)792}$

$21\overline{)378}$

## XLII. Addition

457
913
124
718
323
444
353
232
666

717
308
890
383
262
999
424
282
415

617
297
434
456
913
363
802
791
345

422
560
789
671

## XLIII. Subtraction

$$\begin{array}{r}865341\\ \underline{46233}\end{array}\qquad\begin{array}{r}723597\\ \underline{83701}\end{array}\qquad\begin{array}{r}583121\\ \underline{76243}\end{array}\qquad\begin{array}{r}895752\\ \underline{59863}\end{array}$$

$$\begin{array}{r}400271\\ \underline{38105}\end{array}\qquad\begin{array}{r}687094\\ \underline{54321}\end{array}\qquad\begin{array}{r}284463\\ \underline{18989}\end{array}$$

## XLIV. Division

$$999\overline{)22977}$$

$$31\overline{)868}\qquad 39\overline{)936}$$

## XLV. Subtraction

$$\begin{array}{r}357912352\\ \underline{87527286}\end{array}\qquad\begin{array}{r}975432186\\ \underline{78523321}\end{array}\qquad\begin{array}{r}545123615\\ \underline{80828268}\end{array}$$

$$\begin{array}{r}934105526\\ \underline{65687810}\end{array}\qquad\begin{array}{r}773642\\ \underline{55566}\end{array}$$

## SCHOOL GAMES

I. **Jack Horner's Pie.** The "plums," combinations written on cardboard, are hidden in the "pie," a pan of sand. The children go to the "pie," pull out a "plum," and tell what they have.

II. **Train of Cars.** Write the combinations in rectangles drawn on the board to represent cars. When a child gives the combination, he may couple the car to his train. Let him see "how long a train" he can get. Another child may see how quickly he can "uncouple the cars", saying the combinations, and erasing the marks used to join the "trains."

III. **What Have You.** Give each child a combination card, blank side up. The teacher, speaking to the first child, asks, "What have you?" The child turns his card over and answers, "I have $4+3=7$." He, in turn, asks the child behind him, etc.

IV. **Climbing the Ladder** and its variants. The idea of surmounting some obstacle may be used in a number of variants. (a) Draw a ladder on the board. Place combinations on the rungs. (b) Let the ladder be steps to a castle on the hill. (c) If the children are familiar with gymnasium apparatus, they may climb a knotted rope or along a vertical ladder. To miss is "to fall off," to give the answers rapidly "to run," etc.

V. **Bounce.** Give each child in the class a number which represents a combination already learned. As you say, for example, "Five and four are—," the child whose number is nine jumps up, finishing the problem: "Five and four are nine" and catches the ball which the teacher bounces on "are."

VI. **Fishing** and its variants. (a) Using card-board patterns to save time, draw on the blackboard, fish of different sizes. Label them with number combinations, in so far as is practical, suiting the combination to the size of the fish. Let the children see how many "fish" they can "catch." (b) Use a pail or sand-table for the pond. Combinations written on paper fishes are fastened to the hooks and lines (bent pins on strings) with which the children fish. Then each one tells how large a "fish" he has caught. (c) Somewhat akin to the fishing idea is "telling fortunes" with daisies drawn on the board, by picking off (erasing as the answers are given) combinations written on their petals. (d) In like manner the children may pick apples or other fruit from a tree.

VII. **Post-office.** Combinations on flash cards are the letters. The children go to the "post-office" and get their "letters" by telling the answers to the cards. Sometimes the teacher, at other times, a child may be the post-master.

VIII. **Tit, Tat, Too.** Make a circle either on the floor or the blackboard, with a number in the center and numbers around the edge. For example, if the addition of 3 is to be drilled on, 3 is placed in the center, and numbers from 1 to 10 around the outer edge. The child playing takes a pointer, closes his eyes, goes around the circle, and stopping the pointer, at say 4, opens his eyes and says quickly, $4+3=7$.

IX. **I Am Thinking.** Teacher: I am thinking of two numbers which make 9.

Pupil: Are they $6+3$?
Teacher: No.
Another pupil: Are they $8+1$?
Teacher: No.
Another pupil: Are they $7+2$?
Teacher: Yes, I am thinking of $7+2=9$

Then the pupil whose answer is accepted may suggest the next number to be used, and so on.

X. **Tag.** Choose the combinations upon which you wish to drill. Write them on the board and let each child choose one before the game starts, or give each one a flash card. A child chosen to start the game runs around the class, and "tags" a classmate by saying to him, for example: "5+4." The child tagged must call "9" before he can run after the first. The latter may run after giving the problem, and tries to get into the seat belonging to the child "tagged" without being caught.

XI. **Drop the Handkerchief.** The "dropper" running around the ring puts a combination card into some child's hand. This child must give the answer before chasing the "dropper." If he fails, he stands in the center. A new "handkerchief" is chosen each time from the pile of combination cards.

Do not use these games indoors if the floors are not clean, or else in running, the children will raise a dust.

XII. **I Spy.** See "Hide the 3," p. 9. The children find the answers to the combinations held up by the teacher or a child.

XIII. **Relay Races.** The combinations upon which drill is desired are written in neat columns of equal length on the board. The class is formed into rows or teams of the same number. 1. The first player is given the pointer, and at the signal runs to the board, reads the first combination with its answer, runs to his seat, gives the pointer to the next on his side who is waiting, etc., until the allowance of problems for the team is finished. In like manner the next team then gives answer to the same column, or to another of equal length and difficulty. The team finishing its column in the least time wins. Errors are to be corrected at once by the teacher, or by children chosen to note any, and a specified time for each miss is to be added to the team's record.

2. When the children have played Relay Race a number of times, and know the combinations well, it is possible to have two teams running at the same time. In this case it is not necessary to time them, the one finishing first, being the winner.

3. Have two long lines or columns of combinations equal in difficulty. Let each player in turn say as many for his side as he can in a specified number of seconds, the number being 20, 30, 40, etc., according to the class proficiency. Keep the entire contest short. For example if you allow 30 seconds to a player, you should not have more than 4 on a side.

XIV. **Ring-Toss and Beanbag Games.** See pp. 65-69. In nearly every school, some boy may be found with the necessary ingenuity and willingness to make the beanbag board, while the bean bags can be provided easily by the girls. The bean bags should be made of uniform size, of some firm material, and just large enough to hold ½ pint (or ½ pound) of beans.

## FLASH CARDS FOR DRILL.

**How to Make Them.** Cut cheap, medium weight cardboard into rectangles of such size that you can write on them in figures large enough to be read easily from across your schoolroom. With a rubber marking pencil or an eraser dipped in ink, you can write in large figures on these cards. *By adding the new facts learned each day, you may acquire a complete set of the number facts which have been taught.* If a set is to be used for class drill with the teacher or one pupil holding the cards, the answer to the combination is written on the back in the upper right hand corner. You should also have other sets without the answer on the back, and corresponding cards with just the answer. Sets on smaller cards for desk use are also useful and not hard to make.

**How to Use Them.** 1. The teacher holds the cards one at a time for an instant before the class. (a) The class replies in concert, giving only the result. (b) The pupils answer in concert by rows. (c) The children reply individually in turn. (d) One pupil answers until he makes a mistake or gives a specified number of correct answers. (e) The pupils write the answers in order, checking their lists as the correct answers are read.

2. Pass out a set of cards which do not have the answers on the back. Place the corresponding set of answer cards around the room. Let the children find the answers to the cards they hold.

3. Place the combination cards around the room, give the children the, answer set and let them find the combinations making their answers.

4. Choose two piles of combination cards, the combined answers to which are equal. For example, if in one you put 2+3, in the others have 4+1; in one 3+3, in the other 4+2, etc. Then shuffle each pile. (a) Let there be two teams. Show the cards from one pile to one team, those from the second to the other. Each player as he sees his card writes the result in his team's column. The last member on each team adds the entire column for his side. The side receiving the highest sum wins. Of course only an error in adding can cause a difference in the results. If such an error makes one side's result higher than it should be, subtract the excess from the correct result, and let the remainder be the score for that side. Instead of showing the cards, you may read the combinations. (b) Let each member of each team work the entire drill at his seat. The side having the most results correct, wins.

5. The children form a ring, one in the center, each holding a card on which some number is written. If, for example, the drill is to be on the subtractions of 2, the child in the center has 2 on his card, and the children in the ring the numbers 2 to 12, or as high as desired. The pupil in the center has a pointer. As he points, say to a child with 4 on his card, that child says 4−2=2. The one in the center keeps his place for a specified number of turns or until an answer is passed uncorrected. Sometimes time is saved by having two pupils in the ring point alternately.

6. Some of the pupils are given combination cards, and others the answers. Those having the combinations stand before the class. The "answers" take their proper places.

7. Reverse by having the "answers" stand in front.

8. Desk sets of combination cards with the corresponding answer cards may be given out for seat work. Each child may make his own set.

9. **Arithmetic Matches.** (a) The children stand in line as for oral spelling, giving the answers to the cards instead of spelling words. A child correcting an error may "go up" above the one making it. Note, but do not call attention to any mistake yourself, unless everyone in the class has had a chance and failed to correct it. *Thereby you get more pupils to listen to the replies than when you say, "Next," pointing*

*out the mistake for them.* Give honor marks for "leaving off head" and keep record of the children's places. (b) The pupils who make a mistake go to their seats when the error is corrected. Let the children find how many are standing at the end of a given time. (c) Use the same idea in matching two teams. The side with the most members standing at the finish wins. (d) Perhaps a better way is to have all remain standing on each side. Have a certain number of "innings."

Note the number of errors and corrections made by each side. A correction may cancel an error on the same team. The side having the fewest errors wins. Or, counting each correct answer 1 point, each correction 2, find which side has made the most points.

10. Write a line of combinations on the board. Let one pupil start at one end, and another at the opposite, to see which can write the most correct answers before they meet.

## OUTLINES AND SUGGESTIONS

The aim of pages 1 to 18 (First Year) is to give the children *concrete experience with numbers*, and of pages 19 to 46 (Second Year) to give them a *mastery of number facts*. An outline of the second year work is as follows:

I. The 45 fundamental addition facts.

II. The reverse subtraction facts.

III. Multiplication by 2 of numbers through 10.

IV. Division by 2 of numbers through 10.

V. Simple work with common measures, the foot, yard, pint, quart, gallon; review of measures previously introduced.

VI. Counting by 2's, 3's, 4's, 5's.

VII. By incorporating in the work of these pages, the games and drill devices listed above, the teacher may *enliven the work* so much as desired, and obtain the amount of *drill* and *supplementary work* required to fix the number facts.

The teacher's attention is called to the following points in the plan of the book.

1. With the aim that, from the first, each number fact is to be used independently of any other (as in practice), the number facts are purposely presented *out of order*. These facts are later all summarized in tables.

**2. Each day's lesson teaches one or more definite facts. Each fact is to be learned through work with objects and *used* at once in drills.**

**3. A fact once added to the children's stock is to be kept fresh in their minds, through constant interesting reviews, games, and drills, while new facts are being acquired.**

**4. The advance is usually to be taken up first, in order that the day's new facts may be included in the review.**

Page 19. The first day's lesson is to teach but a single combination. The concrete problems presented, with the objects mentioned, are to teach just the *one fact*. At the close of the lesson write in some conspicuous place $2+1=3$. In view of the children make a flash card. *Review this fact the next day.* This form of procedure may be followed in subsequent lessons.

Page 21. The simple device of placing emphasis on alternate numbers will add interest in counting by 2's. The 3's may be counted in a similar manner as shown on page 24, and the 4's as shown on page 27.

Page 22. Suggestion for Review. "Whoever knows 2 number facts such as $2+1=3$ may write them on the board. When 5 are at the board, no more are to go." "Count the number facts on the board by two's."

Page 24. Suggestion for Original Work. "Would you not like to make a picture of your problem?" (Show 4 apples+1 apple=5 apples by drawing the apples on the board.) "You may make any picture of $4+3=7$ on the board that you wish."

Page 31. *Drill on addends making ten.* Distribute cards on which are written the figures from 1 to 10, inclusive; nine with equal signs; nine with plus signs; nine with 10 on them; and 2 of each of the figures needed to complete the table of tens, once. First child in row runs to front, and holds up card, for example 6. Another runs up with 10, leaving space for the third who fills in with 4, thus completing the statement $6+4=10$. Continue until all cards are used.

Page 32. The *advanced addition facts* are discovered through arranging a known number of objects in different combinations. The facts once presented are to be fixed by review drills as before.

Page 37. Each *subtraction fact* is presented *as the reverse of an addition fact, which has been mastered.* For this reason comparatively small space is devoted to bringing in all the subtraction facts. The plan of presentation necessitates a review of addition facts. Keep up the drill on the new subtraction facts.

Page 40. The fact is to be presented as before, through the addition fact of which it is the reverse. The children and the teachers are to make problems from the suggested material or others they may wish to use. Keep up constant review.

Page 42. Concrete problems may be omitted. Carry just as many review facts as possible. Plan that the ones which seem the hardest receive the most stress. When a fact seems mastered, drop it for a time, lengthening the intervals at which it is taken up.

Pages 74–75. *The School Store.* Plan to make the school store a *permanent feature* of your schoolroom. Carefully worked out, it furnishes a basis for endless motivated work in arithmetic; i. e., learning of current prices and values, much practice in the use of money; making change by the Austrian method; adding of store accounts, multiplication and addition in making a store inventory; learning the values of coins; making of bills and receipts, etc. Little printed bill sheets for daily use add much interest to the work. Keep up drills on the fundamental facts as time permits. The Relay Races, and Arithmetic matches are very good for Miscellaneous Reviews. See also pages 106, 107 and 148.

Page 76. *Examinations and Reviews.* A review, to be valuable, should bring in old material in a *new way:* In making problems for their own examination, the children examine their work from the *teacher's viewpoint,* and incidentally reveal the points upon which they need more drill.

Page 86. *Blackboard Drills.* Do not drop drills on fundamental facts. Devote a part of each day's time to this work. See pages 106, 107, 148 and 162, and choose from the list the drills and games which you find most usable.

Page 162. *Oral Time Drills.* 1. Train the pupils to have practice paper and a pencil ready at the beginning of the period. Tell which drill or part of the drill they are to have. At the signal each starts writing the answers in order as fast as he can. The one finishing first, calls, "One,' the second, "Two," etc. The papers are exchanged and the correct answers read. The pupils now report, in order, their number in finishing, and the number of errors made, if any. The teacher can take these reports as fast as the children talk by having her list of names arranged in the order in which the children are seated. 2. Oral, individual drills may be timed by the watch and record easily kĕpt on a separate sheet, since only a few can recite each day.

## GENERAL SUGGESTIONS

**Learn by Doing.** In harmony with the growing demand for less theory and more practice in elementary instruction, the work in this book, to an unusual extent, is based on *"learning to do by doing."* For example, note building of the tables, pages 47 to 106. In work of this kind, the teacher should be sure that she really gives the children a chance to exercise *their own* initiative. At the same time she must be sure that they clearly understand what is required of them. For other examples of work in which the children "learn to do by doing," see the Ring Toss and Bean Bag games, pp. 65-67, the School Store, pp. 74 and 194, Pupils' Cash Account, p. 190, Estimating Distances, p. 221, and School Project Problems, pp. 207-211.

**Thoroughness.** Children, even in the upper grades, not infrequently add by counting on their fingers because they *never have mastered the fundamental addition facts.* By its careful presentation of each fact, and the extensive provision for review and drills, this book aims to *avoid* any such tendency by insuring a *thorough mastery* of each fact *from the very first.* The children should be drilled on the number facts until they are able to perform the fundamental operations automatically.

**Neatness.** Pupils should be taught neatness in all their work. Especially should they be required to make *plain and legible figures,* since many errors in calculations are due to careless writing.

**Definitions.** Too often pupils are expected to learn definitions of terms before their use is required. Pedagogically and psychologically the *learning* and the *use* should come together. For example the meaning of the signs $+$, $-$, $\times$, $\div$ and $=$, are taught as the pupils have occasion to use them. See notes pp. 79 and 158.

**Illustrated Reference Tables.** The denominate numbers, generally required in the first four grades, are suitably presented in lessons thruout the book. But for review purposes and to assist the teacher, who for any reason may wish to carry the subject further, complete tables of the denominate numbers are given in the back of this book. These tables have the further advantage of being appropriately illustrated.

**Reviews.** The importance of well directed reviews as an end to permanent results cannot be over-estimated. (1) To be effective a review should use old material in solving new situations. (See also p. 277). (2) The interval of review should gradually be lengthened. (3) Reviews should be systematically planned, *featuring the most important or difficult points.*

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# TABLES OF DENOMINATE NUMBERS

**Means For Measuring Dry Substances:***

Pint

Quart

Peck

**For Measuring Liquids:**

Gill

Pint

Quart

Gallon

**For Weighing:**

Scales

## Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

## Liquid Measure

4 gills = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
31½ gallons = 1 barrel (bbl.)
63 gallons = 1 hogshead (hhd.)

## Avoirdupois Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)

One pound Avoirdupois = 7000 grains.

## Troy Weight

24 grains (gr.) = 1 pennyweight (pwt.)
20 pennyweights = 1 ounce (oz.)
12 ounces = 1 pound (lb.)

One Pound Troy = 5760 grains.

## Apothecaries' Weight

60 grains (gr.) = 1 dram (dr. or ʒ)
8 drams = 1 ounce (oz. or ℥)
12 ounces = 1 pound (lb. or ℔)

One Pound Apothecaries' weight = 5760 grains

## Apothecaries' Liquid Measure

60 minims (m.) = 1 fluid dram (ʒ)
8 fluid drams = 1 fluid ounce (℥)
16 fluid ounces = 1 pint (fl. oz. or O)
8 pints = 1 gallon (cong.)

## Measure of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
365 days = 1 common year (yr.)
366 days = 1 leap year

*All schools are not fully equipped with the various measures and instruments required in the study of Denominate Numbers. For this reason suitable illustrations accompany these tables, but necessarily reduced in size.

## TABLES OF D ATE NUMBERS

For M

(ft.)
(yd.)
(rd.)
g (fur.)
(mi.)
=63,360 in.

T

ure

(l.)
(rd.)
(ch.)
(mi.)

Surveyor's Ch

For Surface Measur

foot (sq.ft.)
yard (sq.yd.)
rod (sq.rd.)
(A.)
mile (sq.mi.)
43,560 sq.ft.

ure

chain (sq.ch.)
(A.)
mile (sq.mi.)
(sec.)
ownship (T.)

Car

M

foot (cu.ft.)
ard (cu.yd.)
(cd.)
ot (cd.ft.)
(cd.)

s) chain, some sur-
et long, divided into foot
arked off into tenths.